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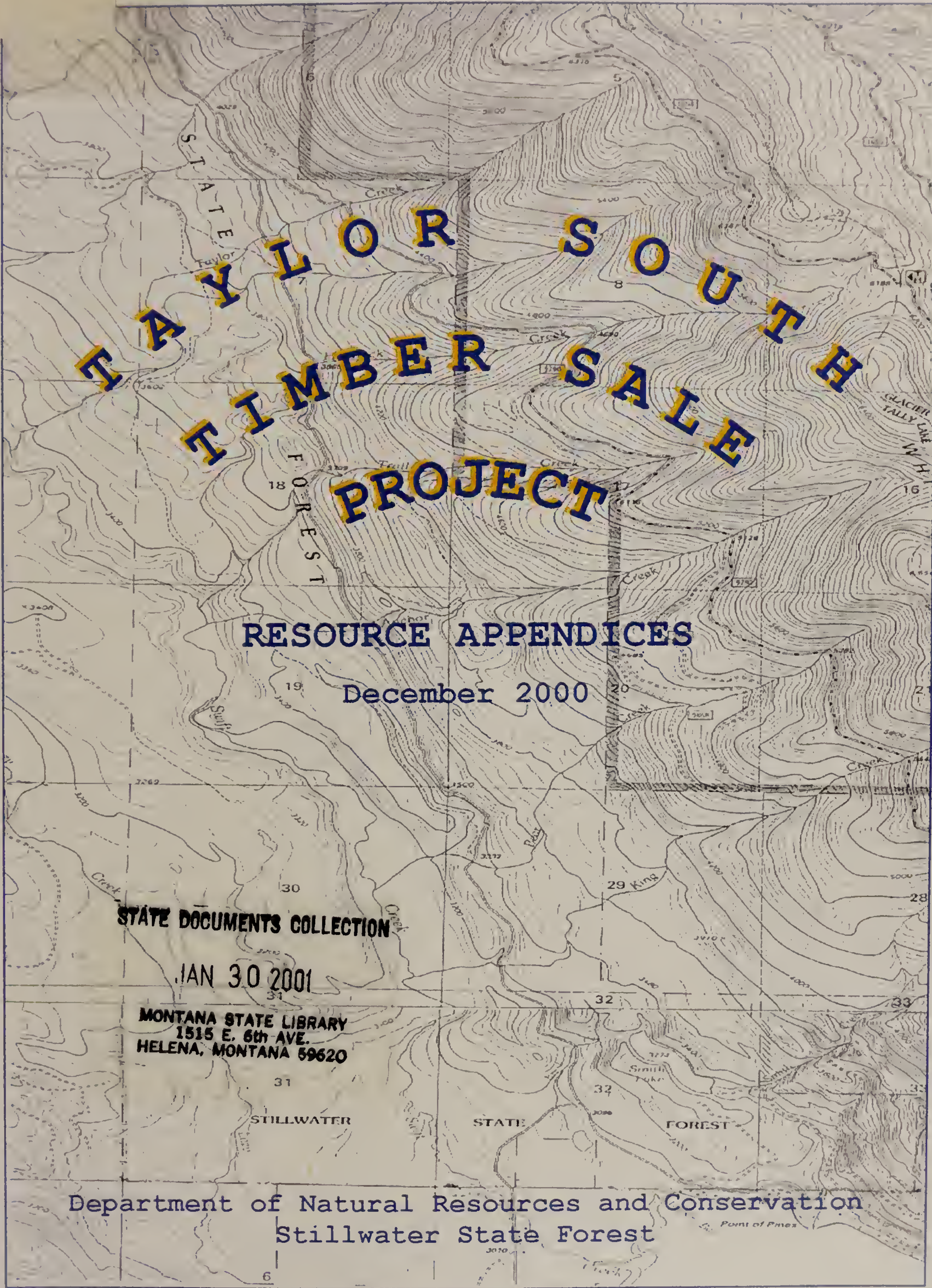
TAYLOR SOUTH TIMBER SALE PROJECT



RESOURCE APPENDICES

December 2000

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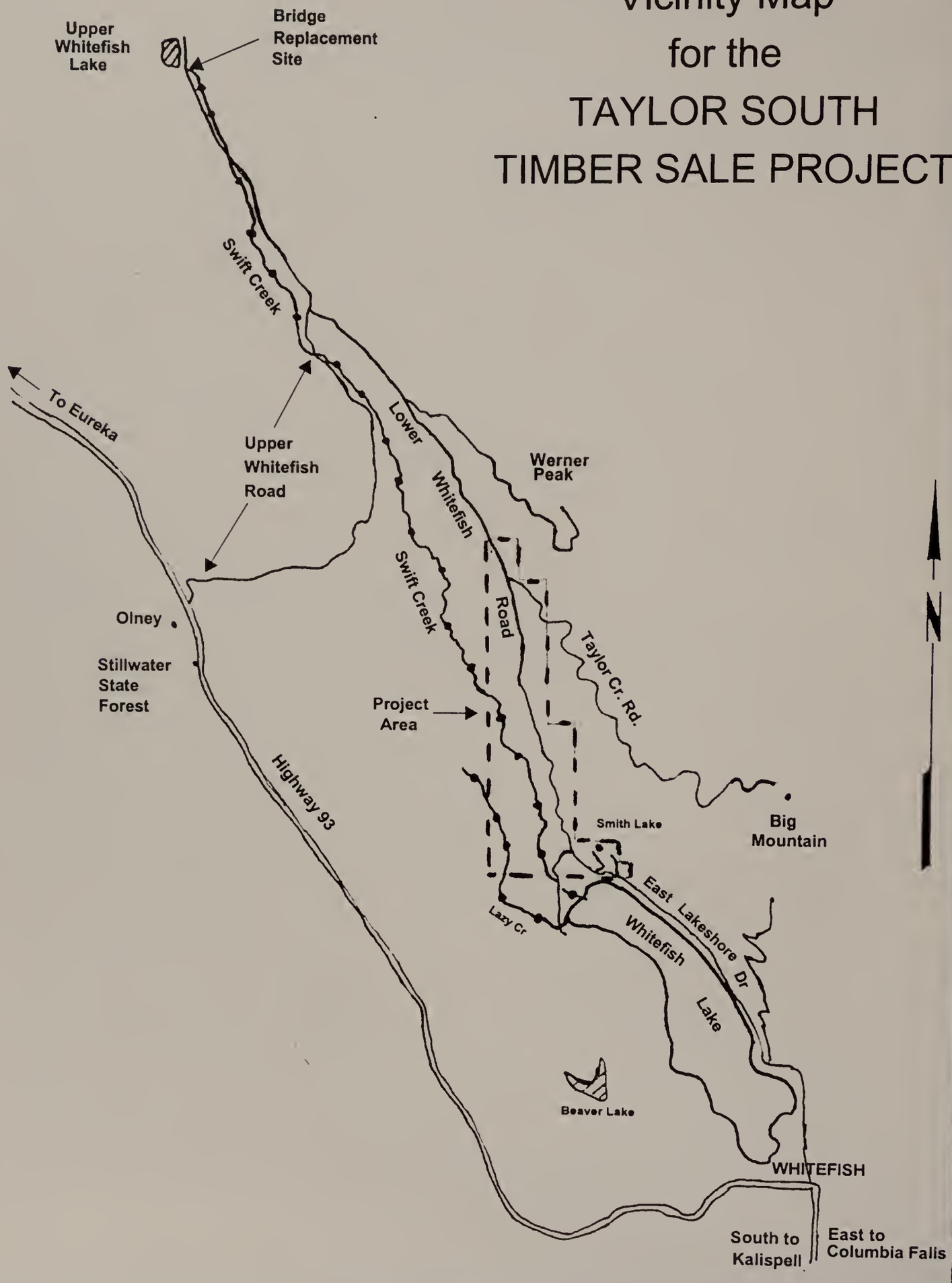
Vicinity Map for the TAYLOR SOUTH TIMBER SALE PROJECT



INTRODUCTION TO RESOURCE APPENDICES FOR THE TAYLOR SOUTH TIMBER SALE PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

The following appendices are a part of the Taylor South Timber Sale Project DEIS (bound separately). The ID Team members prepared the resource appendices; the discussions include citations from other sources, such as research documents, environmental assessments, etc. The lengthy technical discussions of methodologies, research, monitoring, baseline studies, analyses, etc., completed by the ID Team are presented in these appendices. The information in the appendices would need to be utilized for any scientific, technical, or legal review.

ACRONYMS

TAYLOR SOUTH TIMBER SALE PROJECT

ACRONYMS

A.C.B.	Montana State University Grant
A.C.I.	Montana State University - Morrill Grant
BMP	Best Management Practices
CCC	Civilian Conservation Corps
C.S.	Common School Grant
dbh	Diameter at breast height
D.D.& A.	Deaf Blind School Grant
DEQ	Department of Environmental Quality
DFWP	Montana Department of Fish, Wildlife and Parks
DEIS	Draft Environmental Impact Statement
DNRC	Department of Natural Resources and Conservation
EA	Environmental Assessment
ECA	equivalent clearcut acres
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
FI	forest improvement
FNF	Flathead National Forest
HB	House Bill
ID Team	Interdisciplinary Team
FOGI	Full Old-Growth Index
Land Board	Board of Land Commissioners
MBF	thousand board feet
MCA	Montana Codes Annotated
MEPA	Montana Environmental Policy Act
MMBF	million board feet
NWLO	Northwestern Land Office
SFLMP	State Forest Land Management Plan
SLI	stand-level inventory
S.M.	School of Mines Grant
SMZ	streamside management zone
S.N.S.	State Normal School
SSFI	sale-specific forest improvement
TMDL	total maximum daily load
TPA	trees per acre
USFS	United States Forest Service
WYI	water yield increase

124 Permit	Stream Preservation Act Permit
3A Authorization	A Short-term Exemption from Montana's Surface Water Quality Standards

Related
Review

APPENDIX A

LIST OF RELATED ENVIRONMENTAL REVIEWS

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX A

LIST OF RELATED ENVIRONMENTAL REVIEWS

In order to address direct, indirect, and cumulative effects on a landscape level, the analysis must incorporate past, present, and future actions within the analysis area. The following activities are located within the Taylor South environmental analysis area for vegetation on Stillwater State Forest and scattered sections to the north. The environmental analysis area for watershed, wildlife, soils, and fisheries is somewhat smaller in size and encompasses an area specific to those disciplines.

State timber sales where the environmental analysis has been completed and sale activities have begun or have recently been completed:

- Upper Stryker Ridge II Timber Sale (EIS completed in 1996)
- Stewart Butcher Timber Sale (Environmental Assessment [EA] completed in 1998)
- Beaver '99 Timber Sale (Beaver Lake Project EIS completed in 1999)
- Spring-Rock Timber Sale (EA completed in 1997)
- Stillwater Salvage 2000
- Chicken/Werner Timber Sale Project (EIS completed in 1999)
- Mud Creek Timber Sale (EA completed in 1997)
- Edmonds CT Timber Sale (EA completed in 1997)

State timber sales where the environmental analysis has been completed, but sale activities have not yet begun:

- Beaver 2000 Timber Sale (Beaver Lake Project EIS completed in 1999)
- Good/Long/Boyle Timber Sale project (EA and Decision Memo completed in 2000, sale preparation is in progress)

State timber sale proposals where environmental reviews are in progress:

Young/Sophie Timber Sale Project Proposal

The West Fork and Dog/Meadow proposed timber sale projects have been identified on DNRC's 3-year timber sale list as the next potential projects for Stillwater Unit. Currently, there is no initial proposal/proposed action, and the potential projects have not been scoped; therefore, DNRC has not initiated a preimpact study on these proposals.

Activities other than timber harvesting that may affect resources within the Taylor South Timber Sale Project area:

- King Creek right-of-way with F.H. Stoltze Land and Lumber and Plum Creek Timber Company
- King Creek reciprocal access with Owens and Hurst Lumber Company
- Snowmobile License and the repair of Brush Creek crossing
- Taylor Creek Road and Lower Whitefish Road maintenance
- Right-of-way exchange with Flathead County on DelRey Road
- Smith Lake dam maintenance activities

Other activities on adjacent ownership that may affect resources within the Taylor South Timber Sale Project area:

- Ongoing logging on Plum Creek Timber Company, F.H. Stoltze Land and Lumber, and Owen and Hurst Lumpber Company and adjacent small private lands
- General site development

APPENDIX B

STIPULATIONS AND SPECIFICATIONS

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX B

STIPULATIONS AND SPECIFICATIONS

Stipulations and specifications for the action alternatives were identified or designed to prevent or reduce potential effects to resources considered in this analysis. In part, stipulations and specifications are a direct result of issue identification and resource concerns. This section is organized by resource.

Stipulations and specifications that apply to operations required by, and occurring during, the contract period would be contained within the Timber Sale Contract. As such, they are binding and enforceable. Project administrators would enforce stipulations and specifications relating to activities such as hazard reduction, site preparation, and planting that may occur during or after the contract period.

The following stipulations and specifications would be incorporated into the selected action alternative to mitigate potential effects on resources.

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Snag Retention 3
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Soils 4
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Roads 5
Archaeology 6

WATERSHED AND FISHERIES

- Erosion control measures planned include:
  - grade breaks on roads,
  - surface-water-diverting mechanisms on roads,
  - slash-filter windrows, and
  - grass seeding.

  Details for these control measures will be included in Appendix B of the Timber Sale Agreement.

- SMZs will be defined when they occur within or adjacent to harvest areas. This will be done to maintain water quality in areas adjacent to streams.

- Culvert sizing for all road projects will be for a 50-year-flood event, as recommended by the DNRC hydrologist.

- Stream crossings where culvert removals and installations are planned will have the following requirements, as needed, to protect water-quality and meet BMPs:

  - Filter-fabric fences will be in place downstream prior to and during culvert installation.

- Diversion channels will be constructed and lined with plastic to divert streamflow prior to any in-channel operations.

- Contract requirements for bridge removal and installation include:
  - The existing bridge will be used as a work bridge. No equipment will cross the stream channel.
  - Bridge replacement, including abutment work, will be limited to the time period between July 15 and August 20.
  - Silt fences must be installed prior to the startup of earthwork. Silt fences shall be left in place through 1 runoff season or until vegetation is established.

- Remove brush from existing road prisms to allow effective road maintenance. Road maintenance would reduce sediment delivery.

- The contractor would be responsible for the immediate cleanup of any spills (fuel, oil, dirt, etc.) that may affect water quality.

- Leaking equipment would not be permitted to operate at stream-crossing construction sites.

Included in the project proposal are the following pertinent recommendations of the Flathead Basin Forest Practices, Water Quality and Fisheries Cooperative Program Final Report, June 1991.

The following numbers correspond to the numbering of recommendation items contained within the aforementioned document, included in pages 154-162 of the final report.

1. BMPs are incorporated into the project design and operations of the proposed project.

2. Riparian indicators will be considered in the harvest unit layout.

3. Management standards of the SMZ Law (75-5-301, MCA, are used in conjunction with the recommendations of the study.

4. The BMP audit process will continue. This sale will likely be reviewed in an internal audit and may be picked at random as a Statewide audit site.

7. SMZs will be evaluated as a part of the audit process.

11. Swift Creek monitoring is part of the Flathead Basin monitoring effort.

12. Watershed-level planning and analysis is complete. Logging plans of other agencies and private companies are used.

14. DNRC is cooperating with DFWP on a further study of the fish habitat and population for Swift Creek and its tributaries.

15. DNRC will use the best methods available for logging and road building for this proposal.

16A. Existing roads are fully utilized for this proposal.

17. DNRC requested inventory information from DFWP. DNRC's mitigation plan for roads fits all recommendations for "impaired streams". Using "worst case scenario" criteria provides for conservative operations in this proposal.

18. Provisions in the Timber Sale Agreement address BMPs that are rigidly enforced.

20. Planning for long-term

monitoring of Swift Creek is in place.

29-34. DNRC has cooperated with DFWP to continue fisheries work. DNRC will continue to monitor fisheries in the future as funding allows.

BALD EAGLES

- No harvesting within .5 mile of the nest between February 15 and August 15.
- No road maintenance within .25 mile of the nest between February 15 and August 15.

GRIZZLY BEARS

The following items are incorporated into this proposal:

- Grass seeding plans to revegetate roads and landings include seeding with plant species less palatable to grizzly bears to discourage or minimize the potential for bear/human conflicts.
- No logging camps would be allowed in the sale area.
- Garbage hauling would be required daily.
- The Forest Officer would immediately suspend any or all activities directly related to the proposed action, if necessary, to prevent imminent confrontation or conflict between grizzly bears, or other threatened or endangered species, and humans.
- Vigorous patches of Vaccinium sp. will be avoided during scarification when possible.
- While working under contract, contractors will be prohibited from carrying firearms onto restricted roads.
- While harvesting, units accessed by Lower Jellison Road, (Units 3, 5, 6, and 7), temporary road closures would occur on Lower Jellison Road just south of Unit 7. The temporary closure would be moved south of Unit 10 during operations within that unit
- The King Creek/Bear Creek Road (Sections 20 and 29) would not be open when the Lower Jellison Road is open, which would reduce the total amount of road temporarily open during the same time period within the project area.
- Lower Jellison and King Creek roads, which are within an area of spring habitat, would only be open for timber harvesting after the spring period, which ends July 1.
- All gates would be closed after each entry during the general big game hunting season.

WOLVES

A contract provision will protect any wolf den or rendezvous site within the gross sale area that may be discovered during implementation of this proposal.

SNAG RETENTION

- High-quality wildlife trees, such as large, broken-topped western larch, will be designated for retention and given special consideration during yarding operations to prevent loss.
- Snag retention and recruitment guidance (9/97) would be met utilizing standards for warm/ moist habitat types. All snags will be retained that are safe to operate around. Two of the larger trees per acre, preferably

greater than 21 inches dbh, will be retained for future snag recruitment.

- Black cottonwood, western larch, Douglas-fir, and grand fir will be favored for snag recruitment (listed in order of species preference).

AESTHETICS

- Damaged residual vegetation will be slashed.
- The number and size of landings will be limited; the location will be away from main roads, when possible.
- Disturbed sites along road right-of-ways will be grass seeded.
- All small trees within SMZs would be retained.

AIR QUALITY

- To prevent individual or cumulative effects during burning operations, burning will be done in compliance with the Montana Airshed Group reporting regulations and any burning restrictions imposed in Airshed 2. This will provide for burning during acceptable ventilation and dispersion conditions.
- To reduce effects from burning operations:
  - excavator, landing, and roadwork debris will be piled clean to allow ignition to occur during fall and spring when ventilation is good and surrounding fuels are wet. The Forest Officer may require that piles be covered to reduce dispersed (unentrained) smoke. Covered piles are drier, ignite easier, burn hotter, and extinguish sooner.
  - the number of burn piles would be minimized by leaving the large woody debris on site.
- Dust abatement may be applied on some segments of Upper and Lower Whitefish roads used during hauling, depending on the season and level of public traffic.

SOILS

Compaction

- Logging equipment will not operate off forest roads unless soil moisture is less than 20 percent, frozen to a depth that will support machine operations, or snow covered to a depth that will prevent compaction, rutting, or displacement.
- Existing skid trails and landings will be used if their design is consistent with prescribed treatments and meets current BMP guidelines.
- Designated skid trails would be required where moist soils or short steep pitches (less than 300 feet) would not be accessed by other logging systems. This would reduce the number of skid trails and the potential for erosion.
- The logging foreman and sale administrator will agree to a general skidding plan prior to equipment operations.
- The density of skid trails in a harvest area will not exceed 20 percent of the total area in a cutting unit.

Soil Displacement

- Conventional ground-based skidding equipment will not be operated on slopes steeper than 40 percent. Soft-tracked yarders

have less impact than conventional tractor skidding on slopes up to 55 percent. Cable yarding would be used on steeper slopes.

- Piling and scarification would be completed with a dozer where slopes are gentle enough to permit. The steeper slopes, up to 55 percent, would have slash treatment and site preparation done with an excavator. All site preparation activities will meet BMPs.

Erosion

- Ground-skidding machinery will be equipped with a winchline to limit the amount of equipment operation on steeper slopes.

- To reduce surface erosion, roads used by the purchaser will be reshaped and the ditches redefined following use to reduce surface erosion.

- Drain dips and gravel will be installed on roads, as needed, to improve road drainage and reduce maintenance needs and erosion.

- Some sections of roads will be repaired to upgrade the roads to the design standards that reduce erosion potential and maintenance needs.

- The prompt and timely application of certified weed-free grass seed and fertilizer would be applied to all newly constructed road surfaces, cut-and-fill slopes, *and* any existing disturbed cut-and-fill slopes and landings immediately adjacent to open roads. This would be done to stabilize soils and reduce/ prevent the establishment of noxious weeds and would include:

  - seeding all road cuts and fills concurrently with construction;
  - applying "quick cover" seed mix at culvert installation sites within 1 day of when work is completed; and
  - seeding all road surfaces and reseeding culvert installation sites when the final blading is completed for each specified road segment.

- As directed by the Forest Officer, water bars, logging-slash barriers, and, in some cases, temporary culverts will be installed on skid trails where there is a potential for erosion, based on ground and weather conditions. These erosion-control features will be periodically inspected and maintained throughout the contract period or extensions thereof.

NOXIOUS WEED MANAGEMENT

- Surface blading may be required to remove weeds before the seed-set stage on roads affected by the proposal.

- All tracked and wheeled equipment are required to be clean of noxious weeds prior to beginning project operations. The contract-administrating officer will inspect equipment periodically during project implementation.

- Prompt revegetation of disturbed roadside sites would be required. Roads used and closed as part of this proposal would be reshaped and grass seeded.

ROADS

- Road reconstruction activities and road use associated with road construction activities will be relayed to the general public.

- BMPs will be incorporated into all planned road construction.

- Contract administrators will inspect County road surfaces and contact Flathead County Road Department, if necessary, to lessen deterioration of road surfaces.

- All logs from harvest units 1 through 13 will be hauled north on the Lower Whitefish Road to Olney via Upper Whitefish Road.

- Logs from Unit 14 will be hauled along East Lakeshore Drive.

ARCHAEOLOGY

- A review of the project was conducted by a DNRC archaeologist.

- A contract clause provides for suspending operations if cultural resources are discovered; operations may only resume as directed by the Forest Officer.

APPENDIX C

HYDROLOGY

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX C

HYDROLOGY

INTRODUCTION

The Taylor South Timber Sale Project area is located on 11 sections of school trust land north of Whitefish, Montana in Stillwater State Forest. The elevation of this project area ranges from 3,000 feet, where Swift Creek meets Whitefish Lake, to nearly 5,200 feet in Section 7. Precipitation within the project area ranges from 20 inches in the valley bottom to more than 50 inches towards the higher portions of the State ownership. This project includes a disjunct project area that incorporates the bridge that crosses the East Fork of Swift Creek near the outlet of Upper Whitefish Lake. This disjunct project area will be analyzed separately from the main project area.

This portion of the Stillwater State Forest is drained by Swift Creek, a fourth-order stream that is the primary input of surface water to Whitefish Lake and Lazy Creek, which is a third-order perennial tributary to Whitefish Lake. Since none of the proposed harvest is located within the Lazy Creek drainage, no further analysis was deemed appropriate. The proposed project area is drained by a series of first- and second-order stream channels along the west face of the Whitefish range. Each of these creeks is a tributary to Swift Creek. The first- and second-order watersheds in the project area are steep gradient in the upper reaches, but become low gradient when they reach the valley bottom. In the headwater reaches close to the ridges, these streams are intermittent, flowing only during snowmelt and high precipitation events. In the valley bottom, they are primarily perennial, interacting with groundwater and high-water table. In addition to the perennial tributaries to Swift Creek, several smaller water sources (springs and seeps) are present within the project area.

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Regulatory Framework 1
Water Quality 2
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REGULATORY FRAMEWORK

SURFACE WATER-QUALITY STANDARDS

This portion of the Flathead River drainage, including Swift Creek and its tributaries, is classified A-1 by the Montana Surface Water Quality Standards. Waters classified A-1 by the standards must be maintained suitable for drinking and culinary and food processing purposes after

conventional treatment for removal of naturally present impurities. The water quality must be suitable for:

- bathing, swimming, and recreation;
- growth and propagation of salmonid fish and associated aquatic life, waterfowl, and furbearers; and
- uses as agricultural and industrial water supplies.

Among other criteria for A-1 waters, "no increases are allowed above naturally occurring concentrations of sediment…", and "No increase above naturally occurring turbidity is allowed…". Naturally occurring includes conditions or materials present from runoff on developed land where all reasonable land, soil, and water conservation practices (commonly called BMPs) have been applied. Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. Appropriate practices would be applied before, during, and after all proposed management activities.

WATER-QUALITY-LIMITED WATERBODIES

The main stem of Swift Creek is named in the 1996 303(d) list (Waterbodies in Need of Total Maximum Daily Load [TMDL] Development) publication produced by the DEQ. The listed probable causes of impairment are nutrients, other habitat alterations, and siltation. The probable source of impairment listed is silviculture; however, the vast majority of the sediment in the system is thought to result from naturally sloughing banks located along the lower reaches of Swift Creek. Waterbodies listed as water quality limited are prioritized by DEQ for development of a TMDL. Swift Creek is listed as a low priority for TMDL development, and is not one of the top 10 waterbodies proposed for TMDL development. Until a TMDL is developed for Swift Creek, House Bill (HB) 546 (Montana TMDL Law) states that new or expanded activities that may further the listed impairment may commence and continue, provided they are conducted using all reasonable land, soil, and water conservation practices.

WATER QUALITY

EXISTING CONDITIONS

Timber harvesting and related activities, such as road construction, can lead to water-quality impacts by increasing the production and delivery of fine sediment to streams. Construction of roads, skid trails, and landings can generate and transfer substantial amounts of sediment through the removal of vegetation and exposure of bare soil. In addition, removal of vegetation near stream channels reduces the sediment-filtering capacity and may reduce channel stability and the amounts of large woody material. Large woody debris is a very important component of stream dynamics, creating natural sediment traps and energy dissipaters to reduce the velocity and erosiveness of stream flows. Vegetation removal can lead to increased water yield from harvested areas. Substantial annual water yield increases may reduce channel stability and result in sediment sources within the channel.

METHODS

The existing impacts to water quality in the project area were analyzed using 3 methods:

- a stream-channel assessment of all channels within the project area during 1999;
- a detailed sediment-source inventory from roads during 1999; and

- a computer model analysis of the annual water yield increase due to silviculture-related activities on all ownerships.

ANALYSIS AREA

The analysis area for water quality varies with the methods used. The sediment-source inventory and stream-channel assessment encompassed the project area and all roads used for hauling. The annual water-yield analysis area includes the Lower Swift Creek watershed and the Smith Creek and Brush Creek watersheds.

The Lower Swift Creek watershed is approximately 17,200 acres and consists of the main stem of Swift Creek and numerous first- and second-order tributaries to the main stem. The analysis area is the most appropriate for assessing the existing status of Swift Creek near the project area and will provide a good baseline to compare any proposed activities. The entire Swift Creek watershed was also assessed to determine if any of its 5 subwatersheds were at or above a threshold of concern.

The boundaries for all of the watersheds in the project area can be found in *Figure C-1 - Taylor South Watershed.*

RESULTS

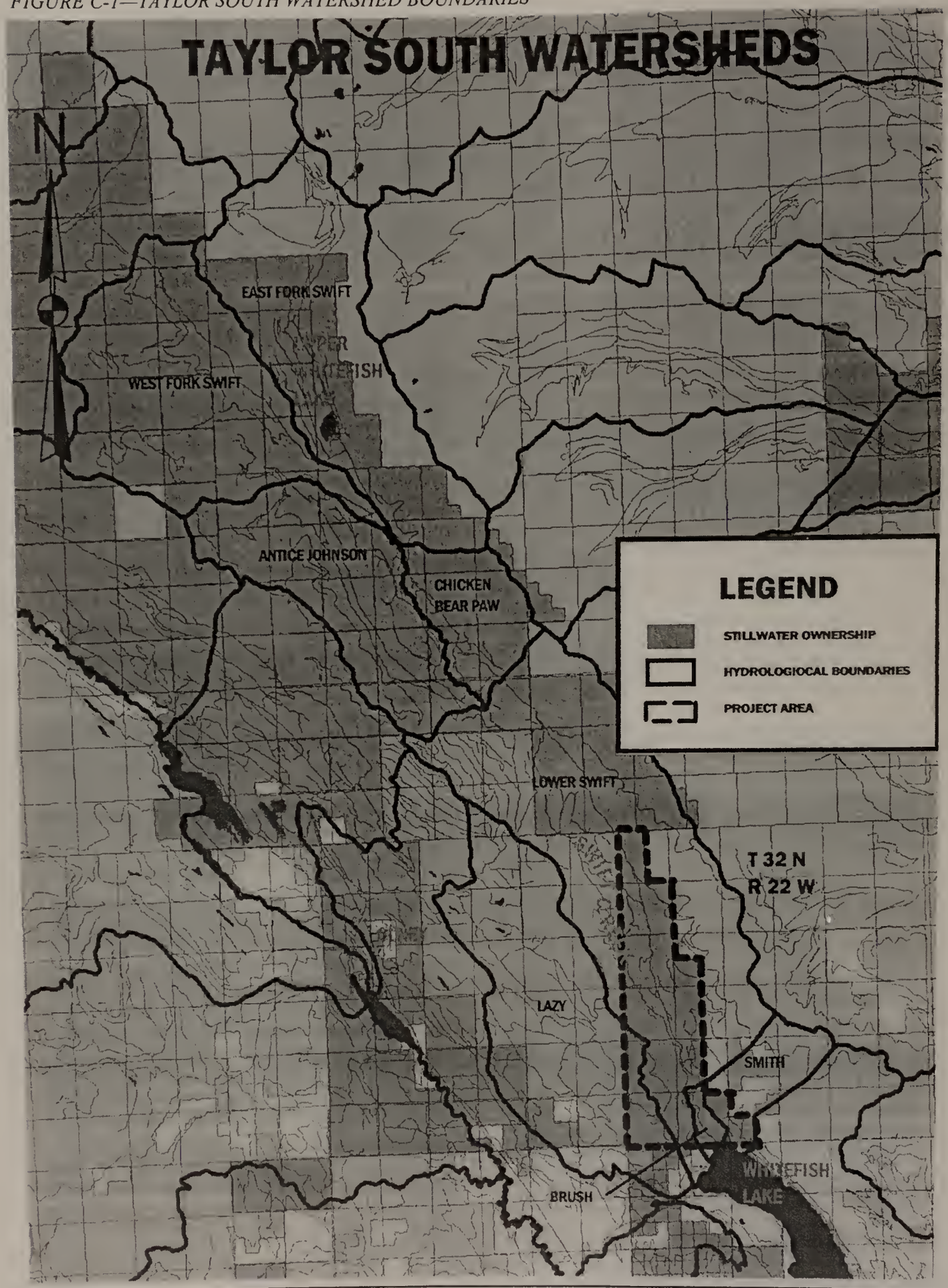
This section looks at the existing condition of the water-resources portion of the project. The existing condition of the channel-stability assessment, sediment-source inventory, and annual water yield is a result of cumulative effects and, thus, should be considered as the cumulative-effects assessment of the water-resources environment prior to the Taylor South Timber Sale Project.

STREAM CHANNEL ASSESSMENT

Each creek channel in the proposed project area was assessed to determine channel stability and to look for in-channel sources of sediment. The data for each stream is located in the Northwestern Land Office hydrology file. Channel stability was found to be in the good to fair range for most reaches of the tributaries to Swift Creek, as well as for Brush and Smith creeks. Stream channels located on the steeper slopes above Lower Whitefish Road are high gradient with large material in the channel bottom. These reaches generally have higher channel stability, and have little evidence of in-channel sources of sediment due to larger channel substrate. The lower reaches of these channels are lower gradient streams; therefore, channel-bottom material is transported to these reaches from the higher gradient areas. The deposition that occurs in these lower reaches has a tendency to build up the streambed with small cobble, gravels, and sand. The finer silt material is generally flushed out of the system during the spring runoff period. The smaller materials that compose the channel beds in the lower reaches are a more mobile size of substrate and, thus, inherently less stable.

Channel stability in the Lower Swift Creek watershed is, generally, in the poor range. This assessment is primarily based on the large mass failures occurring along the lower reaches of the main stem of Swift Creek. These failures are a natural occurrence as Swift Creek cuts through deep, unconsolidated glacial till in order to form a wider flood plain. The portions of the main stem of Swift Creek that are located away from these slope failures are in fair to good condition, with good levels of bank vegetation and large woody debris.

FIGURE C-1—TAYLOR SOUTH WATERSHED BOUNDARIES



SEDIMENT SOURCE INVENTORY

All roads within and leading to the proposed project area were surveyed in 1999 to identify existing or potential sources of sediment. Taylor Creek Road was found to be lacking functional surface drainage. Drain dips have been installed, but most are not built to proper specifications and function marginally or not at all. Some culverts on the Taylor Creek and Lower Whitefish roads are undersized for the 50-year-flood event. In addition, the Hemlock Creek culvert is separated, which may lead to the remainder of the culvert being undercut.

Lower Whitefish Road was reconstructed in 1994 and 1995 with the Werner/Taylor Timber Sale. A few improvements, which have been catalogued and are included in the project file, are necessary to bring the road up to current BMP standards.

WATER YIELD

CUMULATIVE WATERSHED EFFECTS OF PAST ACTIVITIES

Timber harvesting and associated activities can affect the timing, distribution, and amount of water yield in a harvested watershed. Water yields increase proportionately to the percentage of canopy removal; removal of live trees reduces the amount of water transpired, leaving more water available for soil saturation and runoff. Canopy removal also decreases the interception of rain and snow and alters snowpack distribution and snowmelt, which lead to further water-yield increases.

The cumulative effects of past activities in the Taylor South Timber Sale Project area and the Swift Creek watershed were determined using the PC version of the R1WATSED model developed by Region 1 of the USFS. WATSED estimates the increase in water yield caused by removal of live trees using the Equivalent Clearcut Area (ECA) method. ECA is a function of total area roaded and harvested, percent of crown removal in the harvest, and the amount of vegetative recovery that has occurred in the harvest areas. This method equates area harvested and percent of crown removed with an equivalent amount of clearcut area. For example, if 100 acres had 60 percent of its crown removed, ECA would be approximately 60, or equivalent to a 60-acre clearcut. The relationship between crown removal and ECA is not a 1 to 1 ratio, so the percent ECA is not always the same as the percent canopy removal. As live trees are removed, the water they would have evaporated and transpired either saturates the soil or is translated to runoff. This method also calculates the recovery of these increases as new trees vegetate the site and move toward preharvest water use.

In order to evaluate the potential cumulative effects of past activities effectively, a threshold of concern must be established for the Lower Swift Creek watershed. The stability of a stream channel is the best indicator of where a threshold of concern should be set. As water yields increase as a result of canopy removal, the amount of water flowing in a creek gradually increases. When these increases reach a certain level, the bed and banks may begin to erode. The more stable streams will be able to handle larger increases in water yield before they begin to erode, while the less stable streams will experience erosion at more moderate water-yield increases. The channel stability of the streams in and around the project area were

evaluated in 1999 using qualitative assessments, as well as procedures outlined in *Forest Hydrology Part II (1976)*.

Since Swift Creek is listed as a water-quality-limited waterbody in need of TMDL development *(303[d] list)*, the SFLMP Watershed Resource Management Standard 7 states that watersheds in Stillwater State Forest will be managed at a low risk for watershed cumulative effects; because of the destabilizing influence of the mass failures, the recommended threshold of concern is 8% for the Lower Swift Creek watershed. This level is very conservative and is usually implemented only on the more unstable streams.

According to WATSED, the current annual water-yield increase in the Lower Swift Creek watershed is 4 percent over natural. Past harvesting and road construction on all ownerships has generated 2,178 ECA. The Chicken/Werner Timber Sale will add an additional 629 ECA to the Lower Swift Creek watershed within the next 2 years. This additional ECA will increase the annual water yield increase to 5 percent over natural. The estimated threshold ECA level associated with an 8 percent annual water yield increase is 3,440. *TABLE C-1– CUMULATIVE EFFECTS OF PAST ACTIVITIES PREDICTD BY WATSED* summarizes the cumulative effects of past activities on annual water yield in the Lower Swift Creek watershed.

Each of the 5 subwatersheds in the Swift Creek watershed (East Fork Swift, West Fork Swift, Chicken/Bear Paw, Antice/Johnson, and Lower Swift) were also analyzed with WATSED to determine if any individual subdrainage was above the recommended threshold of concern; none were. A weighted average of the subwatersheds showed that the entire Swift Creek watershed is currently at a 5.6 percent water-yield increase above natural.

Past harvesting in these watersheds has been limited to less than 20 percent of the drainage. In order to reach the 8 percent threshold, approximately 20 percent of each watershed would need to be in an ECA condition; therefore, these watersheds are well below the recommended limit.

ENVIRONMENTAL EFFECTS

The primary effect of forest management practices on water quality is sediment delivery to streams. Sediment is generated by road construction and use, especially from roads constructed along or across streams. Timber harvesting in or near riparian areas can reduce the filtering capacity normally provided by vegetation in these areas. To minimize the risk

TABLE C-1 - CUMULATIVE EFFECTS OF PAST ACTIVITIES PREDICTED BY WATSED

EFFECTS OF PAST ACTIVITIES	CURRENT LEVEL	
	LOWER SWIFT CREEK	SWIFT CREEK
Existing ECA[1]	2,807	7,552
Allowable ECA	3,440	9,867
Percent water yield increase over natural[2]	5%	5.9%
Allowable water yield increase	8%	8%

[1] *All values are based on projection year 2001 (including the Chicken Werner Timber Sale, which may not have harvesting completed until the Fall of 2003).*

[2] *Natural condition was determined by WATSED using empirical formulas and are not based on measured values on the ground. Use values only as a comparison to other alternatives.*

of increased sedimentation from harvest units, the harvesting activities proposed in all timber-harvesting alternatives would fully comply with BMPs and the Montana SMZ Law and rules. No harvesting would occur in any SMZ containing bull trout. DNRC has agreed to implement the immediate actions for bull trout restoration (SFLMP Fisheries Resource Management Standards #8) recommended by the Governor's Bull Trout Restoration Team. The width and retention requirements of the SMZ Law on bull trout streams would be exceeded through implementing the fisher guidance on most stream courses.

METHODS

The methodology used to determine the potential impacts of the proposed project to water quality consists of assessing changes or improvements to existing sediment sources identified through field reconnaissance and addressing the impacts of any new activities that could potentially affect water quality.

ANALYSIS AREA

The analysis area was described earlier in this document.

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A***

  Under No-Action Alternative A, no new roads would be constructed and no timber would be harvested. No new water-quality impacts would be generated in the watersheds considered in the proposal beyond those already occurring due to natural processes or past management. No proposed stream-crossing replacements or road improvements would be completed in the project area under this alternative.

- ***Direct Effects Common to Action Alternatives B and C***

  Each of the action alternatives would provide for drainage improvements on Taylor Creek Road from its origin at Lower Whitefish Road to the State boundary in Section 7. This repair work would consist of installing functional surface-drainage features as needed to meet current BMP standards, installing ditch-relief culverts where needed, and replacing the undersized creek crossings. The road is currently eroding from a lack of properly functioning surface drainage; this proposal would relieve the surface water and substantially reduce the amount of sediment generated from the existing road. The stream-crossing replacements would occur at sites where the existing pipe is not properly designed.

  Undersized stream crossings on Lower Whitefish Road would also be replaced under Action Alternatives B and C. The existing pipes are too small, not long enough, and have direct delivery of road runoff to the crossing. The new crossings would be designed to handle a 50-year-magnitude flood event and meet all applicable BMPs.

  All of the proposed projects listed above would be completed following all applicable BMPs and in accordance with the SMZ Law and rules, the SFLMP, Montana Stream Protection Act, Clean Water Act, and other applicable laws and regulations.

  The bridge crossing the East Fork of Swift Creek would be replaced if either action alternative were selected. DFWP would need to approve a 124 Permit prior to the initiation of any work. The

existing bridge will remain in place as a work bridge until the new bridge is installed. This will eliminate the need for equipment crossings in the creek. The risk of sediment entering the stream would be minimized with mitigation measures, such as sediment fences, season of replacement, and prompt seeding of disturbed areas. Without the mitigation measures, sediment could potentially enter the stream and result in degraded water quality until the site naturally stabilizes.

- ***Direct Effects of Action Alternative B***

  In addition to the effects described above, Alternative B would harvest approximately 638 acres of timber in the project area. All units, except units that have slopes over 40 percent, would be harvested using conventional ground-based equipment. Units with slopes over 40 percent would require a soft-track skidder or cable yarder. A soft-track skidder generates substantially less ground disturbance than a conventional tractor or rubber-tired skidder. No harvesting would be implemented within the SMZ of the named streams within the project area; except for Vars Creek, all would have the additional protection of the fisher buffer. The fisher buffer on these streams would be 165 feet on each side of the stream. Some small springs/seeps may have limited tree removal within the SMZ; however, per the SMZ law, to minimize disturbance and limit the potential for sediment transport, no equipment would operate within the SMZ. Since these springs/seeps are not connected to Swift Creek with surface water, there is little risk of sediment reaching Swift Creek.

  The annual water yield would increase by 1 percent in the Lower Swift Creek watershed with the generation of 555 ECA. The Smith Creek watershed would increase 8 ECA, which would not likely result in a measurable increase of annual water yield. The Brush Creek watershed would increase 12 ECA, which would not likely result in a measurable increase in annual water yield.

- ***Direct Effects of Action Alternative C***

  Action Alternative C would harvest timber from approximately 632 acres in the project area and complete the roadwork described above in *Effects Common to Action Alternatives B and C*. All would be harvested using conventional ground-based equipment, except for units that would require soft-track skidders or cable yarders. No harvesting would be implemented within the SMZ of the named streams within the project area; except for Vars Creek, all named streams within the project area would have the additional protection of the fisher buffer. The fisher buffer on these streams would be 165 feet on each side of the stream. Some small springs/seeps may have limited tree removal within the SMZ; however, per the SMZ law, to minimize disturbance and limit the potential for sediment transport, no equipment would be operated within the SMZ. Since these springs/seeps are not connected to Swift Creek with surface water, the risk of sediment reaching Swift Creek is small.

  The annual water yield would increase by 1 percent in the Lower Swift Creek watershed with the generation of 555 ECA. The Smith Creek watershed would

increase 8 ECA, which would not likely result in a measurable increase of annual water yield. The Brush Creek watershed would increase 12 ECA, which would not likely result in a measurable increase in annual water yield.

INDIRECT EFFECTS

- ***Indirect Effects of Action Alternative A***

  These existing problems would continue to recover or degrade as dictated by natural and preexisting conditions until funding sources become available to repair them. However, some of the roads are in a cost-share program and may receive scheduled maintenance.

- ***Indirect Effects Common to Action Alternatives B and C***

  Replacement of these structures would reduce the potential for the crossing to fail and relieve potential sources of sediment. During the period of operation and the following 1 to 2 years, the risk of sediment delivery would be increased due to the exposure of bare soil. This risk would be minimized through implementation of mitigation measures, such as sediment fences, slash-filter windrows, and the seeding of the disturbed sites concurrently with operations. Once the sites revegetate, there would likely be a net improvement over the existing condition by eliminating existing sediment sources and reducing the risk of failure on several potential hazards.

  There were no direct effects to water quality identified with the replacement of the East Fork of Swift Creek bridge.

- ***Indirect Effects of Action Alternative B***

  Channel stability would not likely be degraded with the increase in water yield in any of the streams present in the project area. Design features of this proposal would provide adequate filtration of runoff and would not likely result in additional sediment introduction to streams from harvesting.

- ***Indirect Effects of Action Alternative C***

  Channel stability would not likely be degraded with the increase in water yield in any of the streams present in the project area. Design features of this proposal would provide adequate filtration of runoff and would not likely result in additional sediment introduction to streams from harvesting.

CUMULATIVE EFFECTS

Cumulative watershed impacts are defined as impacts to water quality that may result from the proposed action when combined with other past and present actions. Individually, these actions may not adversely affect water quality, but present a higher risk of adverse impacts when combined.

A list of projects that have been taken into account for current and future planned actions can be located in *Appendix A - List of Related Environmental Reviews*.

Methods

The potential watershed cumulative effects of the alternatives were determined using the PC version of the R1WATSED model developed by Region 1 of the USFS. WATSED estimates the increase in water yield caused by removal of live trees using the ECA method.

Analysis Area

The Lower Swift Creek watershed is the analysis area used to assess the cumulative watershed impacts. This watershed consists mainly of the main stem of Swift Creek and numerous first- and second-order tributaries and is large enough to capture the impacts of the proposal and other activities, yet not so large that the impacts of this proposal are too small to be detected. This information from the Lower Swift Creek watershed will also be put into a weighted average with the other 4 subwatersheds in Swift Creek to determine if the proposed project would put the Swift Creek watershed over its recommended threshold of concern. A qualitative assessment of the first- and second-order watershed in the proposed project area will also be considered.

- ***Cumulative Effects Common to All Alternatives***

  Flathead National Forest (FNF) has planned a prescribed burn north of the proposed project area. The burn project is estimated to cover approximately 80 acres and would generate roughly 10 ECA by killing about 30 percent of the canopy cover on the site. The burn is located on the upper portion of the ridge where canopy closure is currently 50 percent. The project is located on the upper portion of the slope near Werner Peak Lookout and would not take place near any live streams or draws. The burn could, potentially, escape its boundary. Should this happen, additional ECA would be generated beyond the above estimate.

  Plum Creek is also conducting ongoing timber management on its ownership and is planning to harvest on 38 acres in 2000. DNRC will harvest the Chicken/ Werner Timber Sale Project within the next 2 years. An EIS was published in 1999 for this project. Provided all applicable BMPs are applied to these activities and the SMZ Law and rules are followed, adverse cumulative impacts should be avoided.

  The bridge crossing the East Fork of Swift Creek would be replaced if either action alternative were selected. DFWP will need to approve a 124 Permit prior to the initiation of any work. The existing bridge will remain in place as a work bridge until the new bridge is installed to eliminate the need for equipment crossings in the creek. The risk of sediment entering the stream would be minimized with mitigation measures such as the installation of sediment fences, designated season of replacement, and the prompt seeding of disturbed areas. Without the mitigation measures, sediment could, potentially, enter the stream and result in degraded water quality until the site naturally stabilizes. The bridge replacement across the East Fork of Swift Creek would not result in any additional ECA.

- ***Cumulative Effects of No-Action Alternative A***

  No-Action Alternative A would generate no cumulative watershed impacts from the Taylor South Timber Sale Project. Sediment sources would be repaired in the Lower Swift Creek watershed with the Chicken/Werner Timber Sale Project. Current water yield increases (WYI) and ECA levels for the Lower Swift Creek watershed is listed in *TABLE C-2 - COMPARISON OF WATSED-PREDICTED WATERSHED EFFECTS BY*

ALTERNATIVE ON THE LOWER SWIFT CREEK WATERSHED. These values would remain at or near present levels and would continue to decline as past harvest units continue to regenerate and move closer to predisturbance levels of water use and snowpack distribution. Channel stability would likely remain in the fair to good range, since water yield thresholds would not be exceeded. Channel stability could potentially improve in the first- and second-order tributaries as vegetative recovery continues in existing harvest units.

- ***Cumulative Effects of Action Alternative B***

  Some sediment sources would be repaired in the Lower Swift Creek watershed with the Chicken/Werner Timber Sale. Additional sediment sources would be reduced with the Taylor South Project as described in the *direct* and *indirect effects* portions of this document.

  Prescriptions for harvest units are mainly clearcut harvesting with group retention; however, treatments for 2 units would be seedtree harvests and 1 unit would be a light improvement harvest. These proposed activities would generate approximately 555 ECA from 612 acres of harvest units within the Lower Swift Creek watershed. The annual water yield would increase from 5 percent to 6 percent over natural conditions, which also includes all activities listed above on other ownerships in the watershed *(see TABLE C-2—COMPARISON OF WATSED-PREDICTED WATERSHED EFFECTS BY ALTERNATIVE ON THE LOWER SWIFT CREEK WATERSHED)*. The combination of these proposed activities would not put the Lower Swift Creek watershed over its recommended threshold of concern for water yield increases, nor would they put the entire Swift Creek watershed over its threshold. Channel stability would likely remain in the fair to good range since the water yield threshold would not be exceeded.

  The Smith Creek watershed will increase 8 ECA, which will not result in a measurable increase of annual water yield. The Brush Creek watershed will increase 12 ECA, which will not result in a measurable increase in annual water yield.

- ***Cumulative Effects of Action Alternative C***

  Sediment sources would be repaired in the Lower Swift Creek watershed with the Chicken/Werner Timber Sale Project. Additional sediment sources would be reduced with the Taylor South Timber Sale Project as described in the direct and indirect effects portions of this document.

  Action Alternative C would harvest timber from 632 acres in the Lower Swift Creek watershed. Harvest prescriptions would range from a stand improvement cut in Unit 14 to the predominant prescription of shelterwood harvesting. These proposed activities would generate approximately 515 ECA within the Lower Swift Creek watershed and would raise the water yield from its current level of 5 percent over natural to 6 percent over natural *(see TABLE C-2—COMPARISON OF WATSED-PREDICTED WATERSHED EFFECTS BY ALTERNATIVE ON THE LOWER SWIFT CREEK WATERSHED)*. The water-yield increases also include all activities listed above, including other ownerships in the watershed. The combination of these proposed activities, including the activities listed in *Effects Common to all Alternatives*, would

not put the Lower Swift Creek watershed, or the entire Swift Creek watershed, over its recommended threshold of concern for water-yield increases. Channel stability would likely remain in the fair to good range since water yield thresholds would not be exceeded.

The Smith Creek watershed will see an additional 8 ECA, which will not result in a measurable increase of annual water yield. The Brush Creek watershed will see an additional 12 ECA, which will not result in a measurable increase in annual water yield.

TABLE C-2 - COMPARISON OF WATSED-PREDICTED WATERSHED EFFECTS BY ALTERNATIVE ON THE LOWER SWIFT CREEK WATERSHED

	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Acres harvested	0	612	606
Miles of road construction	0	0	0
ECA generated	0	555	515
Cumulative ECA[1]	2,807	3,362	3,322
Allowable ECA	3,440	3,440	3,440
Lower Swift Creek % WYI	5	6	6
Swift Creek % WYI[2]	5.9	6.3	6.3
Allowable % WYI	8	8	8

[1]All values based on projection year 2001, which assumes that the Chicken/Werner Timber Sale is harvested during 2000.

[2]Swift Creek values generated by calculating a weighted average of water yield increases from East Fork Swift, West Fork Swift, Chicken/Bear Paw, Antice/Johnson, and Lower Swift Creek watersheds.

Fisheries

APPENDIX D

FISHERIES

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX D

FISHERIES

INTRODUCTION

Westslope cutthroat trout and bull trout are species of special concern in Montana; they are found in limited numbers and habitats. The bull trout was listed as a threatened species under the Federal Endangered Species Act in 1998. DFWP manages the Stillwater River drainage, including Swift Creek, for the native westslope cutthroat trout and bull trout.

Timber harvesting and associated activities, such as road construction and reconstruction, have the potential to add sediment to creeks if not conducted with the proper mitigation measures. The addition of sediment, over time, has the potential to affect bull trout and other salmonids by degrading the gravel used for spawning and rearing habitat. The cumulative impacts to fish habitat and bull trout are very similar to the cumulative impacts to the watershed.

Cumulative effects are defined as impacts that may result from the proposed action when combined with other past and present actions. Individually, these actions may not adversely affect bull trout habitat or populations, but when combined, present a higher risk of adverse impacts. Among other things, activities that have the potential to affect bull trout habitat and populations include road construction, especially where it is nearby or crossing a creek, and the removal of live trees, which can lead to increased runoff and associated erosion of streambeds and streambanks.

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METHODS

The procedures used to evaluate the cumulative effects of past activities to bull trout and westslope cutthroat trout are, primarily, the same as those used to assess the effects of past management. Although numerous other factors lead to the decline of bull trout populations, such as management of other aquatic species and fishing regulations in Swift Creek, Upper Whitefish Lake, Whitefish Lake, Whitefish River, Stillwater River, Flathead Lake, and Flathead River. These are all managed by the DFWP and are not controlled by DNRC. Water-quality impacts can also impact the populations of fish species such as bull trout by modifying spawning and rearing habitat.

In order to meet the recommendations for these species from the Flathead Basin Forest Practices, Water Quality and Fisheries Cooperative Program (the cooperative study report) *(Flathead Basin Commission, 1991)*, DNRC has contracted DFWP and arranged for the collection efforts required to develop index values of existing habitat quality as recommended. The DNRC/DFWP strategy is to first develop the index of juvenile bull trout rearing-habitat quality using substrate scoring and McNeil coring as described in the cooperative study report. Based on the results from substrate scoring, DNRC, in consultation with DFWP, will decide if additional monitoring is necessary. The monitoring consists of first surveying for species composition to determine the presence of bull trout or westslope cutthroat trout. If either species is found, then spawning surveys, McNeil coring, and substrate scoring are conducted.

The Flathead Basin Forest Practice Study showed a direct link between on-the-ground activity *(Sequoia Index)* and habitat quality *(McNeil coring)*. The study showed an even stronger tie between spawning habitat quality (percent fines) and embryo survival to emergence. The cooperative recommended caution when the amount of fine material (percent <6.35 mm), as indicated by McNeil coring, exceeded 35 percent. Recommendations call for a red flag at levels above 40 percent.

ANALYSIS AREA

The cumulative effects analysis area for this proposal consists of the perennial tributaries to Swift Creek found in the proposed project area and the main stem of Swift Creek downstream from the project area. The disjunct project area that includes the bridge site on the East Fork of Swift Creek is also within the fisheries analysis area.

EXISTING CONDITION

The Swift Creek perennial tributaries and the main stem of Swift Creek were sampled by Tom Weaver from DFWP from 1992 through 1999 to determine whether bull trout or westslope cutthroat trout inhabit these streams. No bull trout were found in the perennial tributaries to Swift Creek, although resident westslope cutthroat trout were found in King, Bear, Trail, Hemlock and Taylor creeks. Through a snorkel survey of the main stem of Swift Creek, both bull trout and westslope cutthroat trout were found to inhabit the main stem. The area has not yet been surveyed for spawning activity. The amount of stream to be surveyed is extensive and will likely be conducted in the fall of 2001. McNeil coring and substrate scoring cannot be completed until spawning sites are identified.

The East Fork of Swift Creek is the tributary stream and outlet for Upper Whitefish Lake, which supports a disjunct bull trout population. Westslope cutthroat trout have also been planted in Upper Whitefish Lake. Bull trout redd surveys have been conducted upstream and downstream of Upper Whitefish Lake. No redds were found downstream of the lake during 1995, 1996, 1997, or 1999. Spring electroshocking surveys below the lake have shown no eveidence of emerging bull trout fry. The bridge replacement is downstream of the lake. Since the bridge replacement will not affect upstream populations, this analysis will not include habitat or populations upstream of the lake.

CUMULATIVE EFFECTS

Past timber harvesting has occurred since the 1920s within the proposed project area and Lower Swift Creek watershed. The timber harvesting activity involved the construction of roads within the Lower Swift

Creek watershed, including the Lower Whitefish Lake and Taylor Creek roads. Each of these roads is located within the proposed project area. Summaries of the condition of these roads and the cumulative watershed effects of past activities are found in the watershed portion of this document. As stated, the road system has existing and potential sources of fine sediment that can affect downstream spawning and rearing habitat. Numerous in-channel sources of sediment were identified on the main stem of Swift Creek and are described in more detail in the watershed portion of the document. Current water yield increases in the Lower Swift Creek and entire Swift Creek watersheds are currently well within recommended thresholds of concern.

ENVIRONMENTAL EFFECTS

DIRECT EFFECTS

The expected impacts to fisheries due to the direct, indirect, and cumulative effects of this and past, present, and future planned actions are closely connected to the effect of water quality. The water quality analysis should be used as a reference for the fisheries analysis.

- ***Direct Effects of No-Action Alternative A***

  The fisheries habitat condition would, essentially, remain unchanged. The monitoring of fisheries habitat by DNRC may be discontinued for the main stem of Swift Creek until future projects present the need for additional data.

- ***Direct Effects Common to Action Alternatives B and C***

  The proposed project would harvest timber from a range of 632 to 638 acres, depending on the alternative. Harvesting in the SMZ is not prescribed on any of the streams that contribute surface flow to Swift Creek. As discussed in the watershed section, surface drainage and stream crossings will be improved to meet current BMP standards on the Lower Whitefish and Taylor Creek roads. The existing crossings are not properly designed and represent a potential risk to water quality and fish habitat if they were overtopped by a high runoff event.

  The bridge that crosses the East Fork of Swift Creek near the outlet of Upper Whitefish Lake would be replaced under Action Alternatives B and C. The bridge replacement would not inhibit fish passage or migration. Proper permits to protect the stream channel, water quality, and fish habitat would be obtained for all activities. With the following design features and mitigation measures implemented, no direct take on bull trout is likely:

  - All work must comply with BMPs.
  - Activities would not take place during the migration period unless there is no flow in the stream.
  - Activities would take place during low-flow, or no-flow, season.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A***

  Existing and potential sources of erosion and fine sediment would be left in their current condition and would continue to improve or degrade as dictated by natural and preexisting conditions.

- ***Indirect Effects Common to Action Alternative B and C***

  The road improvement activities may produce short-term increases in fine sediment to the Swift Creek tributaries during the period of operation. With proper mitigation measures in place during and after the construction period, the risk of fine sediments reaching Swift Creek is low and, over time, would decrease as bare soil revegetates. The proposal could lead to a long-term reduction in the contribution of fine sediment to spawning gravels for the following reasons:

  - improvement of the existing Taylor Creek Road would reduce the amount of fine sediment eroded and delivered to draw crossings, and
  - several existing and potential sources of sediment at stream crossings would be mitigated with properly designed structures that meet all current applicable BMPs.

  No indirect effects to fisheries are expected from the replacement of the East Fork to Swift Creek bridge.

CUMULATIVE EFFECTS

- ***Cumulative Effects Common to All Alternatives***

  FNF is planning a controlled burn near the proposed project area within the Lower Swift Creek watershed to restore whitebark pine stands near the ridgetop. Plum Creek Timber Company is planning ongoing timber harvests on its land within the Lower Swift Creek watershed. For a more detailed description of these projects and their anticipated impacts to water quality, refer to the watershed section. Since neither of these projects would contribute cumulative watershed impacts beyond a recommended threshold of concern, there is a low risk of adverse cumulative impacts to bull trout or westslope cutthroat trout as a result of these proposals.

- ***Cumulative Effects Commom to Action Alternatives B and C***

  The cumulative impacts of the proposed project to bull trout and westslope cutthroat trout are closely related to the cumulative effects to the watershed. The proposed project would harvest timber from a range of 632 to 638 acres, depending on the alternative. Harvesting in the SMZ is not prescribed on any of the streams that contribute surface flow to Swift Creek. As discussed in the watershed section, surface drainage and stream crossings will be improved to meet current BMP standards on the Taylor Creek and Lower Whitefish roads. The existing crossings are not properly designed and represent a potential risk to water quality and fish habitat if they were overtopped by a high runoff event. These activities may produce short-term increases in fine sediment to the Swift Creek tributaries during the period of operation. With proper mitigation measures in place during and after the construction period, the risk of fine sediments reaching Swift Creek is low and, over time, would decrease as bare soil revegetates. The proposal could lead to a long-term reduction in the contribution of fine sediment to spawning gravels for the following reasons:

  - improvement of the existing Taylor Creek Road would reduce the amount of fine sediment

eroded and delivered to draw crossings, and
- several existing and potential sources of sediment at stream crossings would be mitigated with properly designed structures that meet all current applicable BMPs.

The bridge that crosses the East Fork of Swift Creek near the outlet of Upper Whitefish Lake would be replaced under Action Alternatives B and C. The bridge replacement would not inhibit fish passage or migration. Proper permits would be obtained for all activities to protect the stream channel, water quality, and fish habitat. No direct take on bull trout is likely with the following design features and mitigation measures implemented:

- All work must comply with BMPs.
- Activities would not take place during the migration period unless there is no flow in the stream. If activities were to take place during the migration period, the potential risk to individual fish species would increase.
- Activities would take place during low-flow or no-flow season.

APPENDIX E

VEGETATION

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX E

VEGETATION

INTRODUCTION

The vegetation section will provide a detailed description of the present conditions of the forest and then address the potential effects of the proposed alternatives related to the following issues:

- Stand development, structural composition, and species composition of the forest on the landscape
- Forest health in regard to risks and losses at the project level
- Old-growth commitments that will focus on the amounts and attributes of old-growth stands

LANDSCAPE ANALYSIS

BACKGROUND

The SFLMP directs DNRC to take a coarse-filter approach to biodiversity by favoring an appropriate mix of stand structures and compositions on State land *(Montana DNRC 1996)*. To implement a coarse-filter approach and meet SFLMP directives, landscape analysis techniques were used to determine an appropriate mix of stand structures and compositions, including forest cover-type representation, age-class distribution, and structural characteristics.

ANALYSIS METHODS

The analysis will compare the desired stand conditions that DNRC believes to be appropriate for the site with current stand conditions.

Inventory data from the 1930s was used in *Losensky's 1993* data to estimate the proportions of various stand-structural stages by cover type as they were historically represented throughout the Inland Northwest. This provides an estimate of the natural characteristics of forests prior to fire suppression and extensive logging. *Losensky (1997)* worked with DNRC to complete an analysis for the entire State; some vegetation types specific to that work are included in this analysis.

The protocol used to assign cover types using Stillwater Unit's SLI is explained in detail in the SFLMP Biodiversity Guidance *(May 1998)*. Database crosstabs and tables that were used in the analysis are in the project file. The SFLMP Biodiversity Guidance and databases *(TIMBST97 and STWOGI_00)* are available at the Stillwater Unit office in Olney.

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ANALYSIS AREA

The vegetation analysis includes 3 geographic scales:

- The Upper Flathead Valley - Historic conditions refer to those from Climatic Section 333C of the Upper Flathead Valley *(Losensky 1997)*. For this analysis, the historic conditions for Climatic Section 333C relate to forest cover types and age-class distributions only.

- The Stillwater State Forest management block - Current and appropriate conditions were analyzed on the scale of the entire Stillwater State Forest and scattered sections in northeastern Lincoln County (approximately 98,195 acres), based on the SLI STWE_OGI database file, 03/09/2000.

- The project level - Within the project area, the stands proposed for harvesting will be analyzed by harvest unit.

Analyses will use both the Stillwater State Forest management block and the project-level analysis areas throughout.

The SLI database is updated on an annual basis to include information corrections on a stand-level basis or to cover scheduled changes where harvesting activities had taken place. This update process provides DNRC foresters with the best available data for the required analysis on proposed management activities. Where ongoing and future timber sales have not yet received a postharvest inventory, probable effects are taken into consideration to address cumulative impacts in each analysis area. The display of effects will show the trends in cover-type conversions and age-class distributions.

Within the analysis area are 3 other proposed timber sales where initial planning and development are taking place concurrently with the analysis of this sale. The estimated effects of these projects on cover types, age-class distributions, and old growth will be considered in a cumulative-effects analysis for Stillwater State Forest.

EXISTING VEGETATION

The existing vegetative types on Stillwater Unit and within the project area are a result of various site factors, fire regimes, and past management practices.

SITE FACTORS

Site conditions vary depending on their geographic, physiographic, and climatic factors. These conditions include features such as:

- soil types *(refer to Appendix K - Soils)*,
- aspects (many of the sites proposed for harvesting have a southwesterly to northwesterly exposure),
- positions on the landscape (the Taylor South Timber Sale Project area is mostly on the lower slopes of the Whitefish Range),
- growing seasons, and
- moisture availability.

These variables helped develop the habitat-type classifications used to describe successional development and timber productivity, among other things *(Pfister et al, 1977)*.

Within the Taylor South Timber Sale Project area, 70 percent of the habitat types are in the warm to moist climatic regimes, which include mostly grand fir and western hemlock habitat types; of the acres proposed for harvesting, 93 percent are in the same habitat types or climatic regimes.

Forest productivity on these sites is rated moderate to high. These sites are predominantly occupied with grand fir, Douglas-fir, western larch, and western white pine, with scattered representations of ponderosa pine, western hemlock, and western red cedar.

FIRE REGIMES

Habitat types have also been grouped to indicate the severity and frequency of wildfires that historically may have occurred on a site *(INT 223; Fischer and Bradley, 1987)*. Ninety-three percent of the proposed harvest units are in Fire Group 11. Stand-replacing fires have been estimated to occur once every 100 to 200 years on the proposed harvest sites. Less severe fires likely occurred more often and, in broad locations, would have helped maintain seral and western larch relic stands. These are stands with large trees that have survived numerous fires dispersed throughout.

Recorded fire history in the project area includes:

- In 1925 a fire burned on the lower slopes in Section 33.
- Following the harvesting of nearly 5.8 MMBF in 1928 and 1929 in Section 31, the slash was treated through broadcast burning. A large portion of the section regenerated back to a lodgepole pine cover type with a mix of western larch *(Lazy Swift EA, 1995)*.
- Various other fire patterns are visible in the 1954 and 1964 aerial photographs.
- Since the 1930s, fire-suppression efforts have also had effect on the existing stand structures in Stillwater State Forest.

PAST MANAGEMENT ACTIVITIES

Past inventory records display that timber harvesting has been ongoing in the project area since the 1920s. Some of the first harvest records in the area are from 1928 through 1930; they show that most of the harvesting activity occurred west of Swift Creek and within the southern portions of the project area in Sections 29, 32, and 33. Lower Whitefish Road was extended into the Upper Whitefish Lake basin in the mid-1930s by the Civilian Conservation Corps (CCC) and increased access capabilities. Harvesting activity increased in the northerly portions of the project area in the late 1940s and early 1950s. Approximately 28 MMBF was harvested from the project area between 1948 and 1952.

Between 1994 and 1996, DNRC timber sales within the Taylor South Timber Sale Project area have been:

- the Lazy Swift Timber Sale, which harvested approximately 1.4 MMBF from 290 acres in Section 31, T32N, R22W, and
- the Werner/Taylor Timber Sale, which harvested 4 MMBF and overlapped the Taylor South Timber Sale Project area in Sections 6, 7, 18, 19, 20, 29, and 30, T32N, R22W.

TIMBER HARVESTING TRENDS

In the 1920s through the early 1950s, the priority for timber harvesting was tie logs. Western larch was the preferred species for making railroad ties in the inland northwest. Estimates of volume harvested by species during this era show that over 85 percent of the volume harvested were Douglas-fir and western larch *(DNRC Section Record Cards, Forest Management Bureau)*. Timber harvesting was selective in the removal of overstory trees; general site

preparation was not accomplished, except for the harvest in Section 31. Without site preparation, the understory trees continued to grow and now make up the forested conditions. Records from the 1920s and 1930s describe the forest types in Sections 6 and 7 as having a very high amount of grand fir regeneration and/or saplings under a canopy of western larch. The trend was to allow the existing shade-tolerant understory to grow and be managed for sawtimber at a later date. Thus, minimal reinvestment into the stand was required.

The Lazy/Swift and Werner/Taylor timber sales have followed a different trend; these sales retained many larger-diameter seral trees, including large relics, in the harvest units and have prepared these units for seral regeneration. In the Lazy/Swift Timber Sale, live and dead lodgepole pine was harvested; western larch was not harvested. Less than 33% of the volume harvested from the Werner/ Taylor Timber Sale was a combination of western larch and Douglas-fir.

The harvested areas in both timber sales have received dozer or excavator site preparation. The units in the Lazy/Swift Timber Sale are regenerating with western larch and lodgepole pine. Regeneration on the Werner/Taylor Timber Sale units includes western larch, ponderosa pine, western white pine, and lodgepole pine regeneration.

COVER-TYPE REPRESENTATIONS FOR THE ANALYSIS AREA

LANDSCAPE LEVEL (COARSE FILTER)

Figure E-1 illustrates the percentage of forested ground that is/was occupied by a particular cover type. The comparisons shown include the Upper Flathead Valley historic data and the current and appropriate conditions on the scale of the analysis area.

Data indicates mixed-conifer stands are currently overrepresented in reference to both historic conditions and conditions that DNRC feels would be appropriate by using historic data. Many species that make up the mixed-conifer cover type are shade tolerant and increase in the species component of stands as the interval between disturbances, such as wildfire, is lengthened.

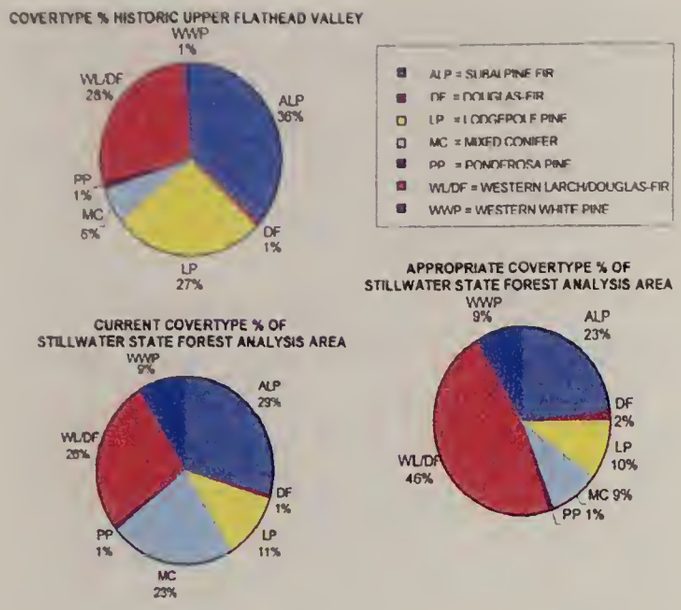
The western larch/Douglas-fir cover type is currently underrepresented on Stillwater State Forest in reference to desired, or appropriate, cover types. Western larch and lodgepole pine are not shade tolerant and the species have, historically, been perpetuated through fairly intensive disturbances, such as wildfires. This data sort indicates that the current amount of the western white pine cover type is similar to what occurred historically; however, white pine blister rust infestations have drastically affected western white pine. In reality, the number of healthy western white pine that occupy the canopy as overstory dominants has been on the decline for several decades across most of the Pacific Northwest; the Taylor South Timber Sale Project area is no exception.

AGE CLASS

AGE-CLASS DISTRIBUTION ON THE ANALYSIS AREA (LANDSCAPE-LEVEL COARSE FILTER)

Age-class distributions delineate another characteristic important for determining the average historical, or appropriate, conditions. When distributions are combined with information on cover types, a fairly clear picture emerges, over time, of the average forest conditions. Knowledge about local topographical effects, ecological characteristics

FIGURE E-1

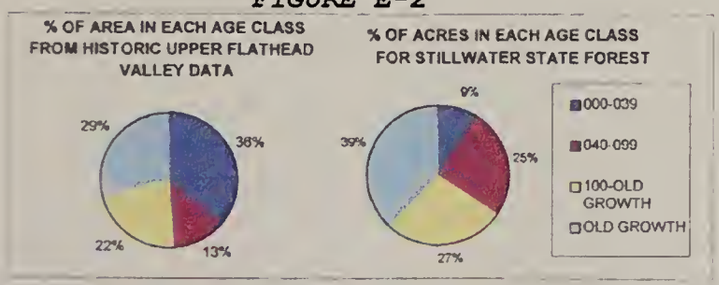


of tree species, climatic vegetation relationships, and disturbance regimes adds clarity to the picture of appropriate conditions.

Inventories of the 1930s quantified the ages of the forest stands. To arrive at age estimates, Losensky examined the data and projected the stands back in time to the early 1900s. This data is useful in setting baseline conditions for determining the extent that current forest age-class distribution deviates from average historical conditions.

Figure E-2 compares the current condition of age classes on Stillwater State Forest with the historical conditions from Upper Flathead Valley.

FIGURE E-2



Comparing the entire Stillwater State Forest with historical data from the Upper Flathead Valley shows that Stillwater State Forest is low in stands of the seedling/sapling age class and higher in stands that are in the 40-year and older age classes, relative to historic conditions.

DIRECT EFFECTS TO COVER TYPES AND AGE CLASS

- ***Direct Effect of No-Action Alternative A***

  The western larch/Douglas-fir cover type would likely continue to be underrepresented unless a large disturbance, such as a wildfire or another timber sale, occurs. Shade-tolerant trees would continue to regenerate under closed-canopy forests.

  No immediate change from the existing environmental condition is expected in regard to age-class distribution.

- ***Direct Effects of Action Alternative B***

  Mixed conifer cover types would decrease by 148 acres following harvesting, site preparation, and tree planting activities. The western white pine and western larch/Douglas-fir cover types would increase 115 acres and 33 acres, respectively, following these activities.

  Harvesting would change 148 acres within mixed-conifer stands from over 40 years old to the 0 age class; 436 acres of western white pine would change from over 100 years old to the 0 age class; and 20 acres of western larch/Douglas-fir in the 100-years-plus classes to the 0 age class.

- ***Direct Effects of Action Alternative C***

  Mixed conifer cover types would decrease by 144 acres following harvesting, site-preparation, and tree-planting activities. Western

white pine and western larch/ Douglas-fir cover types would increase 115 acres and 29 acres, respectively, following these activities.

Harvesting would be implemented within 144 acres of the mixed-conifer cover type greater than 40 years old; 436 acres of the western white pine cover type greater than 100 years; 20 acres of the western larch/Douglas-fir cover type greater than 100 years; and 8 acres of the ponderosa pine cover type greater than 150 years. A new age class would result in the understory of these harvested stands following site preparation and tree planting activities.

INDIRECT EFFECTS TO COVER TYPES AND AGE CLASS

- ***Indirect Effects of No-Action Alternative A***

  Over time, natural forest succession and fire suppression would reduce the variability of age classes and cover types on the landscape, thus, reducing biodiversity.

- ***Indirect Effects of Action Alternative B***

  Given the similarities of the harvest with mixed-severity/stand-replacement fires and the species composition within proposed harvest areas, the species representation of the overstory would vary slightly from the expectations of a wildfire under naturally occurring conditions. Regeneration would be mostly western larch, Douglas-fir, western white pine, and scattered ponderosa pine, which is similar to what would be expected following a fire. Grand fir, subalpine fire, western hemlock, and western red cedar would also be a component in stands within these fires types.
  The proposed clearcut/seedtree with group retention prescription calls for 80 to 90 percent of the proposed units to be harvested. This amounts to, approximately, 450 acres that would receive mechanical site preparation and have minimal overstory competition for the seral species that regenerate naturally and through planting. The open conditions help the regeneration become established and outcompete brush and other tolerant tree species.

  The forest would contain a mosaic of structures to include single-storied, two-storied, and multistoried conditions. This would be typical of mixed-severity fires where large portions of the "fire" area may be stand replacing. Fires tend to burn hot through some areas, thus, opening up the site for new regeneration, creating the single-storied stands. Fires also tend to pass through areas causing very little mortality, especially in species such as the thicker-barked western larch, Douglas-fir, and ponderosa pine.

  The scale or sizes of the harvest units, as a whole, is typical of fire in Fire Group 11 *(Fisher and Bradley)*.

  The patterns planned for groups of retention trees would be typical of postwildfire conditions. Due to the existing forest conditions, there would be more grand fir retained within these group-retention areas than would be expected under naturally occurring conditions.

- ***Indirect Effects of Action Alternative C***

  Following harvesting and the retention of 15 to 40 trees per acre, the canopy closure would range between 10 and 39 percent. Typical low-intensity fires may retain this level of overstory

trees, but the species retained would likely be the thicker-barked western larch and Douglas-fir, not grand-fir. Most regeneration would be western larch, Douglas-fir, scattered ponderosa pine, and a representation of western white pine. Grand fir, subalpine fir, western hemlock, and western red cedar would also regenerate in these fire types.

The shelterwood prescription calls for areas of heavy overstory retention. Due mainly to overstory competition, an estimated 66 percent of the area harvested, about 395 acres, would have suitable conditions for regenerating seral tree species. Site conditions may be favorable for the early survival of seedlings under the overstory, but optimal growth may not be attained. To maintain growth and outcompete brush and other tolerant tree species, another harvest to remove much of the overstory would be needed.

Following the establishment of regeneration, the structure in harvest units would be 2-storied, which may be typical of underburns (low-severity fires).

The scale or size of the harvest units would not be typical of low-intensity fires.

The pattern of leave trees over the landscape would be uniform and would not be typical of a fire on this landscape or in this fire regime.

The species composition would include more grand fir than would likely occur on a site that experiences frequent low-intensity fires.

The SLI would display no change in age class following harvesting.

CUMULATIVE EFFECTS TO COVER TYPES AND AGE CLASS

Cumulative Effects of All Alternatives

Cumulative effects of projects listed in *APPENDIX A—LIST OF RELATED ENVIRONMENTAL REVIEWS* are expected to increase the amount of the western larch/Douglas-fir cover type approximately 3% on Stillwater State Forest. This trend toward seral cover types would result in a reduction of the area across the forest in the mixed-conifer and subalpine fir cover types about the same 3%. *TABLE E-1—CUMULATIVE EFFECTS TO COVER TYPE ACREAGES BY ALTERNATIVE* gives the anticipated cumulative effects of those sales listed in Appendix A with the STWE_OGI database as baseline data.

Plum Creek Timber Company and Stoltze Land and Lumber Company are managing their lands with the various harvest practices. A higher percentage of acres and younger age classes of seral species are replacing the older stands that have occupied these sites in the past; this is expected to continue. This would decrease the average age of forest stands in the general vicinity of the project area.

Past timber sales and wildfires have led to the current age-class representations in this area. Future sales would likely continue to take place with the potential to modify some age-class distribution within stands. Any changes in age classes would be reevaluated during scheduled SLI updates.

Charts reflect data from the STWE_OGI database that was updated in March 2000. This database does not include some ongoing timber sales; therefore, cumulative effects from those sales listed in *Appendix A - List of Related Environmental Reviews* will be added in this section. The effect to age class

and the acreage effects are taken from several sources, including the appropriate EAs/EISs, timber sale contracts, and a visual review of the harvested areas. *TABLE E-2– CUMULATIVE EFFECTS TO AGE CLASSES BY ALTERNATIVE* displays cumulative effects by alternative against the baseline STWE_OGI data.

Cumulative effects on old growth (stands over 150 years old) by cover type are again reflected in the *Old Growth* section of this appendix.

TABLE E-1 - CUMULATIVE EFFECTS TO COVER TYPE ACREAGES BY ALTERNATIVE

COVER TYPE	AREA (ACRES) AS ASSESSED BY STWE_OGI DATABASE	CUMULATIVE AREA (ACRES) ASSESSED WITH ADDITIONAL PROJECTS (ALSO REPRESENTS NO-ACTION ALTERNATIVE)	AREA (ACRES) AS ASSESSED WITH CUMULATIVE AND ALTERNATIVE B	AREA (ACRES) AS ASSESSED WITH CUMULATIVE AND ALTERNATIVE C
Alpine fir	28,657 (29.3%)	28,531 (29.1%)	28,531 (29.1%)	28,531 (29.1%)
Douglas-fir	843 (0.9%)	843 (0.9%)	843 (0.9%)	843 (0.9%)
Hardwoods	123 (0.1%)	123 (0.1%)	123 (0.1%)	123 (0.1%)
Lodgepole pine	10,519 (10.8%)	10,073 (10.3%)	10,073 (10.3%)	10,073 (10.3%)
Ponderosa pine	805 (0.8%)	805 (0.8%)	805 (0.8%)	805 (0.8%)
Mixed conifer	22,864 (23.4%)	20,430 (20.9%)	20,282 (20.7%)	20,285 (20.7%)
Western larch/ Douglas-fir	25,147 (25.7%)	27,117 (28.8%)	28,150 (28.8%)	28,146 (28.8%)
Western white pine	8,811 (9.0%)	8,847 (9.0%)	8,963 (9.1%)	8,963 (9.1%)

TABLE E-2 - CUMULATIVE EFFECTS TO AGE CLASSES BY ALTERNATIVE

ALTERNATIVE	0 TO 39 YEARS OLD	40 TO 99 YEARS OLD	100 TO 149 YEARS OLD (EXCEPT LODGEPOLE)	150 YEARS PLUS
Area as assessed by STWE_OGI database	8,091	24,925	26,983	37,770
	8.3%	25.5%	27.6%	38.6%
Cumulative area with additional projects assessed (also represents No-Action Alternative A)	9,216	24,712	26,586	37,279
	9.4%	25.2%	27.2%	38.1%
Area as assessed with cumulative and Action Alternative B	9,820	24,682	26,345	36,946
	10%	25.2%	26.9%	37.8%
Area as assessed with cumulative and Action Alternative C	9,216	24,712	26,586	37,279
	9.4%	25.2%	27.2%	38.1%

FOREST HEALTH

BACKGROUND

Defining forest health conditions is an inherent part of designing project-level timber sales. Some forest conditions are predisposed to some level of disturbance, whether from insects, diseases, winds, or wildfires. Recognizing these conditions or trends and developing a system to reduce environmental and financial losses is crucial.

ANALYSIS METHODS

Stillwater State Forest is observed from the air annually and insect and disease problems are mapped. DNRC and USFS provide a report with updates on insect and disease trends across the Inland Northwest. In addition to investigating these findings, DNRC personnel also include their findings of additional forest health conditions as they occur on Stillwater State Forest.

The focus on the Taylor South Timber Sale Project will include:

- the forest health trends in relation to insects, diseases, and wildfires;
- immediate conditions in relation to the project or harvest areas;
- management recommendations; and
- potential sawlog value losses to the trusts.

ANALYSIS AREA

The analysis area is primarily within the Taylor South Timber Sale Project area.

INTRODUCTION

The insects and diseases known to occur on the project area include:

Indian paint fungus - *Echinodontium tinctorium**

Douglas-fir beetle - *Dendroctonus psuedotsugae**

Western larch dwarf mistletoe - *Arceuthobium larici**

White pine blister rust - *Cronartium ribicola**

Mountain pine beetle - *Dendroctonus ponderosae*

Armillaria root rot - *Armillaria ostoyae*

White pocket rot - *Phellinus pini*

Rhabodocline needlecast - *Rhabdocline pseudotsugae*

Fir engraver - *Scolytus ventralis*

An asterisk denotes that insect or disease is further described in detail. Other insects or diseases listed are present in the project area, but are not recognized as being out of control or having many management implications.

⇒ Indian Paint Fungus *(Echinodontium tinctorium)*

Indian paint fungus is well distributed throughout the project area and is infecting the grand fir and subalpine fir trees. Stand-exam and reconnaissance surveys reveal that 15 to 20 percent of the grand fir and subalpine fir are infected with this decay. Generally, infected trees are rotten and contain very little sawlog quality.

The problem is partially due to:

- the aggressive nature of the stem decay,
- the age of the residual grand fir and subalpine fir, and
- logging damage that occurred in the past.

As described in the previous section, *PAST MANAGEMENT ACTIVITIES*, grand fir, left on site following harvests for railroad-tie material in the 1940s

and 1950s, are now infected with paint fungus. Infections from Indian paint spores may lie dormant up to 50 years; dormant infections are activated by mechanical injuries, frost cracks, and other wounds *(Filip et al, 1983)*.

The *Forest Insect and Disease Manual* recommends that the advanced regeneration that has developed under an infected overstory not be retained. Also recommended is to avoid damaging or wounding trees during harvesting operations, especially if a heavy retention of grand fir is planned, such as in a commercial thin operation.

⇒ **Douglas-fir Beetle *(Dendroctonus psuedotsugae)***

The Douglas-fir bark beetle is currently attacking large portions of the Inland Northwest's Douglas-fir populations. Stillwater State Forest and the project area have scattered pockets of dead Douglas-fir across the landscape.

Douglas-fir bark beetles attack, specifically, Douglas-fir trees, usually over 14 inches dbh, although beetles do attack smaller diameter trees. Generally, low populations of beetles will infest freshly blown-down or fire-killed trees or pockets of Douglas-fir trees with root rot disease. With higher beetle populations, stands with low vigor and other stresses, such as drought or Armillaria root rot infections, are at higher risk to attack.

In 1999, numerous pockets of infestation were located in the southern portion of the project area. Reconnaissance surveys were conducted by DNRC entomologist, Steve Kohler, and foresters to determine future risk levels within stands containing high concentrations of Douglas-fir. Reports provided for this survey indicate that, potentially, over 400 acres are at high risk for additional infestations. This survey was conducted following the spring 1999 flight of the beetle. Guidance from the *Forest Insect and Disease Identification and Management Handbook* and Kohler recommend salvaging the infested trees prior to the beetle flight in the spring of 2000. Stillwater Unit's timber permit program allowed for salvaging 30 MBF of sawlogs in August 1999. Firewood gatherers cut, approximately, 10 MBF from several infestation sites, which was an uncompensated loss.

The DNRC staff again surveyed this area in June 2000 to observe the beetle flight and check the results of last year's salvage. Often infestations will expand to live trees beyond the initial pocket; minimal attacks were noted around the salvaged pockets. Aerial observations in 2000 noted an infestation concentration missed in 1999. Ground verification has found approximately 3.5 acres of Douglas-fir to be infested from 1999 and 2000 beetle attacks. As in 1999, Kohler recommends that beetle-infested trees be harvested to lower the incidence of new attacks (personal communication). Dependent upon conditions and directives, Stillwater Unit's salvage program would salvage dead and freshly attacked trees to help reduce further losses.

A low incidence of Douglas-fir bark beetle attacks has occurred in the areas proposed for harvesting. Approximately 20 percent of the trees in the harvest units are Douglas-fir. The Douglas-fir trees in most of the proposed harvest areas are at a lower risk due to their age and

stocking density; there is less food source to sustain a beetle population.

⇒ **White pine blister rust (*Cronartium ribicola)***

White pine blister rust, a nonnative disease, is the primary cause for the decline in western white pine trees in the project area. Trees, seedling-sized to over 30 inches dbh, become infected from airborne spores. Some individual trees do display a natural resistance to the infection, which could either be a genetic attribute or because exposure to the rust's spores were limited.

Western white pine trees are regarded as high-value sawlog material, averaging $500 per MBF *(University of Montana, 2000)*. Western white pine that were harvested from the Werner/Taylor Timber Sale Project area and the 1999 area salvage permit averaged $300 per MBF. This species, also, has been highly favored by firewood gatherers. Dead tops are often associated with diseased western white pine; this reduces sawlog volume and value. The mountain pine beetle is often the final cause of mortality on trees stressed from blister rust.

Management recommendations are to reestablish stands of western white pine that have a measured resistance to blister rust at a much higher representation than currently exists. Mature trees that show some resistance to the disease would be retained and additional rust-resistant seedlings would be planted.

⇒ **Western larch dwarf mistletoe (*Arceuthobium laricis)***

Western larch dwarf mistletoe appears to be patchily distributed over the entire project area. Mistletoe causes the branches to form dense clumps or "witches-brooms". Many infections have progressed enough to cause mortality, which is most common when minimal foliage is left to sustain life, giving the larch woodborer the opportunity to finally kill the tree. Portions of the project area have a high level of mortality relative to other areas on Stillwater State Forest.

Dwarf mistletoe is a parasite that generally spreads from overstory trees to young regeneration. It reduces the vigor, growth rate, quality, and quantity of forest products produced; quality and quantity of tree seed produced; and predisposes trees to attacks by insects and infections by fungi *(Wicker and Leaphart, 1974)*. Fire hazard is also increased due to the accumulation of fuels at the base of the tree.

Within the northern sections of the project area, scattered larch overstory trees are obviously infected with the parasite. The scattered nature is mostly due to past harvesting practices. In the southern portion of the project area where western larch representation is much higher, the infections cover small portions of stands.

Firewood gatherers are aggressively salvaging dead larch.

⇒ **Mountain pine beetle (*Dendroctonus ponderosae)***

Mountain pine beetles infested many of the lodgepole pine stands in the project area in the 1980s. These stands, primarily in Section 30, were harvested in 1995/1996 under the Lazy-Swift Timber Sale. Currently, no stands in the project area are at risk to major mountain pine beetle infestations.

⇒ **Fir Engraver (*Scolytus ventralis*)**

Fir engraver is a common pest in the stands with a high representation of grand fir but concentrations are rare. The primary host is grand fir; occasionally subalpine fir, Douglas-fir, western hemlock, and spruce are attacked. Usually, one finds an occasional attack resulting in topkill, branch killing, or killing a patch of the bole surface. This usually does not result in death.

⇒ **Western Balsam Bark Beetle – *Dryocoetes confuses***

Western balsam bark beetle is a conspicuous pest and is responsible for high amounts of mortality in subalpine fir, and, occasionally, in grand fir. To date, no concentrations have been found in the project area. To prevent epidemics from developing, weakened and beetle-infested trees or windthrow should be salvaged where feasible and the logging slash destroyed.

WILDFIRE HAZARDS AND RISKS IN THE TAYLOR SOUTH PROJECT AREA

The hazards and risks associated with wildfire consist of the loss of timber resources, effects to watersheds, and loss of property, to name a few. The hazard has increased due to the interruption of interim fires since the onset of fire-fighting efforts. The success of suppression efforts has led to an accumulation of fine fuels, dead wood components, and ladder fuels within stands. These conditions increase the likelihood of high-intensity fires which are often considered stand-replacement fires.

Another hazardous condition related to the start of fires in this area of Stillwater State Forest is the increased recreational use and adjacent residential development.

Forestland adjacent to the project area consists of areas with wide ranges of fuel loading. Much of the adjacent Plum Creek ownership has been harvested in recent years and the resulting stands have a low wildfire risk due to light fuel loading. Most of the USFS lands above the project area have not been harvested since the 1960s.

Fuel loadings vary due, in part, to the site location and position on the Whitefish Divide; the ridgetop and steep slopes leading up to the ridge have less down woody material than midslope stands.

FOREST HEALTH DIRECT EFFECTS

- ***Direct Effects Common to All Alternatives***

  Stands at high risk to Douglas-fir beetle infestations are not a part of either action alternative. Scattered beetle infestations are expected to continue.

  Although the dwarf mistletoe does attack several other tree species, any additional effects to those species is likely indiscernible.

- ***Direct Effects to No-Action Alternative A***

  Sawlog volume would continue to be lost from the project area due to rot.

  As a result of this proposal, no additional acres of western white pine cover types would be regenerated.

  Mortality rates due, in part, to the western larch mistletoe infections would be similar to current rates.

  The wildfire hazard would not change substantially in the short term.

- ***Direct Effects Common to Action Alternatives B and C***

  Both action alternatives would recover approximately 3 MMBF of grand fir sawlogs, reducing a potential long-term loss of sawlog volume and revenue due to stem rots.

  High concentrations of Indian paint fungus would still be within corridors retained around streams.

  Potential losses of dead mistletoe-infected western larch to firewood gatherers would be lessened, especially around the proposed Unit 13.

  Immediately following timber harvesting, there would be an increase in the amount of fine flashy fuels. DNRC's hazard-reduction program requires that measures be taken to reduce the hazards of wildfires. These mitigations are included in our current State Hazard Reduction Standards.

  All of the prescribed harvest methods would reduce ladder fuels by harvesting grand fir, Douglas-fir, Engelmann spruce, and subalpine fir, which are a higher crown-fire hazard because of their low-growing branches and combustible nature.

FOREST HEALTH INDIRECT EFFECTS

- ***Indirect Effects Common to All Alternatives***

  Indirectly, activity east of Swift Creek has created an awareness of the Douglas-fir beetle situation, which has resulted in the salvage of approximately 30 MBF. Since deferring stands west of Swift Creek, that area has not been examined on the ground for Douglas-fir bark beetle attacks in 2000.

- ***Indirect Effects to No-Action Alternative A***

  School trusts may lose long-term revenue due to:

  - mortality rates and increased sawlog defect caused by the blister rust and
  - not regenerating high-valued species such as western white pine.

  The spread of western larch dwarf mistletoe would mostly occur within stands regenerated from the Werner/Taylor Timber Sale (around 1995).

  Eventually, due to the accumulation of fine fuels, snags, ladder fuels, and dead wood components, the risk of a stand-replacement fire would increase.

- ***Indirect Effects Common to Action Alternatives B and C***

  In the long-term, grand fir regeneration may become infected with Indian paint fungus, but, overall, grand fir would not be favored as crop trees through precommercial thinning operations; therefore, loss of value would be minimized.

  Spacing around trees being reserved from harvesting should be wide enough to reduce wounding. Rots and dwarf mistletoe often enter a tree through wounds.

  Fire-resistant trees, such as the thick-barked western larch and Douglas-fir, left in the stands would be more likely to survive as a result of low-intensity burns and ground fires. Harvesting in stands that are heavily composed of older lodgepole pine would also reduce the overall fire risk and expected intensity of the type of burn that entirely consumes mature lodgepole pine stands.

- ***Indirect Effects to Action Alternative B***

  Groups of mature trees containing infected grand fir would be retained. Generally, the sapling-sized understory would be removed during logging and site-preparation activities.

  As a result of regeneration harvests, approximately 360 acres would be planted with rust-resistant western white pine. Site conditions should be favorable for optimal growth of the regeneration; in approximately 15 years, the site should be reevaluated for precommercial thinning purposes.

  Risk of infection from western larch dwarf mistletoe would be reduced to existing and future larch regeneration following harvesting activities.

- ***Indirect Effects to Action Alternative C***

  Scattered mature trees containing infected grand fir would be retained. Generally, advanced grand fir regeneration would be removed during logging and site-preparation activities, except along roadside buffer zones. These buffer zones would contain higher amounts of cull grand fir than the remainder of the harvest units.

  The percent of grand fir regenerating would likely be high due to the amount of canopy closure and shading; the seral component would not be as highly represented among the regeneration. Over time, grand fir would likely outcompete shade-intolerant serals unless the overstory competition is removed in the future.

  As a result of harvest treatments, approximately 300 acres would be planted with rust-resistant white pine. Site conditions should be favorable for the early survival of seedlings, but, due to overstory canopy competition, optimal growth may not be attained. A site evaluation should be made approximately 5 years after planting to determine the need to do additional overstory harvesting.

  Risk of infection from western larch dwarf mistletoe to the existing and future larch regeneration remains similar to existing conditions following harvest treatments.

FOREST HEALTH CUMULATIVE EFFECTS

- ***Cumulative Effects Common to All Alternatives***

  Timber management activities on Stillwater Unit, such as implementing prescriptions to reduce losses due to stem rots, Douglas-fir beetles, white pine blister rust, and dwarf mistletoe have improved forest health.

  DNRC's salvage program may remove some of the infested trees prior to the spring flight of the Douglas-fir bark beetle if salvage criteria can be met.

  Whether or not an action alternative is selected for this project, the risk of wildfire would continue to increase as a result of long-term fire suppression.

OLD-GROWTH REPRESENTATION

This section contains background information on DNRC's old-growth commitments and ongoing development of the old-growth index.

BACKGROUND

The SFLMP states that DNRC would seek to maintain or restore old-growth forests in amounts of at least half the average proportion, which would be expected to occur with natural processes on similar sites *(Montana DNRC 1996)*. Old growth must be retained not only in the amounts committed to, but also in appropriate proportions and sites across the landscape. The Biodiversity Guidance adopted in May 1998 will be viewed as the current procedure for managing for biodiversity and old growth on State lands. This guidance replaces methods previously used since the implementation of the SFLMP (1996). This is described in *Supplemental Biodiversity Guidance: Old Growth Management Strategies and Definitions (December 1999)*:

> ***When developing the State forest Land Management Plan (SFLMP), Remington's paper, Biological Diversity Strategies for Forest Type Groups, was included as an example of how DNRC might manage for biodiversity under the SFLMP. Remington's paper was not intended to be prescriptive, but was solely meant to be an example of some of the concepts we would consider in meeting our biodiversity commitments. In particular, the Strategies for Specific Forest Type Groups provides generalized statements regarding ecological considerations that may be important in determining appropriate treatments in the various forest type groups. The paper was never intended to provide cookbook approaches to meeting our commitments, especially given that portions are contradictory to SFLMP direction and intent.***
>
> ***Biodiversity RMS 7 in the SFLMP states, "Biological Diversity Strategies for Forest Type Groups or other current references would be used as guidance for landscape-level biodiversity evaluations, old-growth protection, and design of timber harvests to promote biodiversity. The Biological Diversity Strategies would be updated periodically, with professional review, as new information and concepts are developed."***
>
> ***In May 1998, Remington's Biodiversity Strategies was superseded by the Biodiversity Guidance as allowed for and encouraged under Biodiversity RMS 6 and 7. The Biodiversity Guidance was sent out for internal and external professional review in the summer and fall of 1997. Remington's Biodiversity Strategies is cited in the biodiversity Guidance as being a tool to help suggest appropriate cover types for various habitat types (BIO-9); however, Remington's Study is not to be used where it is inconsistent with the Biodiversity RMS or the Biodiversity Guidance.***
>
> ***In particular, the Landscape Planning and Old-Growth Protection portions of Remington's Study are not applicable to current management strategies since they are inconsistent with direction in Biodiversity RMS 1, 3, and 6. The adoption of the Biodiversity Guidance in May 1998 clarified these inconsistencies and should be viewed as the current procedure for managing for biodiversity and old growth on State lands.***

ANALYSIS METHODS

DNRC approaches the issue of old-growth retention from the perspective that the characteristics of old-growth stands, which make them functionally different than

TABLE E-3 - CURRENT AMOUNT OF OLD GROWTH BY COVER TYPE IN THE ANALYSIS AREA COMPARED TO MINIMUM-RETENTION LEVELS USING THE METHODOLOGY DEVELOPED IN THE BIODIVERSITY GUIDANCE FOR THE SFLMP (STWE-OGI DATA BASE 3/9/2000)

LOSENSKY TYPE	MINIMUM OLD-GROWTH RETENTION ACRES	CURRENT OLD-GROWTH ACRES	DIFFERENCE BETWEEN CURRENT AND MINIMUM ACRES OF OLD GROWTH
Ponderosa pine	302.5	219.4	83.1 (below)
Douglas-fir	50.7	272.9	222.2 (above)
Western larch/ Douglas-fir	10,530.2	11,304.8	774.6 (above)
Lodgepole pine	250.4	253.3	2.9 (above)
Western white pine	771.3	6,367.4	5,596.1 (above)
Mixed conifer	1,911.3	8,900.8	6,989.5 (above)
Subalpine fir	2,289.8	10,445.9	8,156.1 (above)
Totals:	16,106.2	37,764.5	21,658.3 (above)

other stands, should be defined and managed for.

Although no estimates of historic amounts of old growth are available, there are estimates of historic age-class distributions and accompanying estimates of proportions of old stands. The information is available from a forest inventory conducted in the 1930s across western Montana. *Losensky (1997)* summarized the 1930s inventory showing proportional age-class distributions by climatic section. The proportion of old stands within a given analysis area compared to the climatic-section proportion from the 1930s inventory is DNRC's numeric criterion for assessing compliance with our commitment to retaining a minimum of 50 percent of old-growth amounts that would be expected to occur with natural processes on similar sites. DNRC will assess the structural attributes associated with old age that characterize the variety of forest conditions that would have naturally occurred on the landscape. This will be done to the degree data is available both on the project level and over the entire analysis area.

ANALYSIS AREAS

The 3 scales of analysis described previously for vegetation will also be used for old growth.

OLD-GROWTH COMMITMENTS

Stands with a substantial overstory component of 150 years old and older and at least 4 MBF per acre are considered old-growth stands in this analysis. The exceptions are lodgepole pine stands, which were sorted as old stands if they were 139 years old or older. This working definition will encompass both stands with high and low levels of old-growth attributes and does not determine the quality and value of these stands as wildlife habitat for old-growth-associated species or other functions of old stands. Old growth is analyzed for these other characteristics, specifically, in the Vegetation and Wildlife sections of the project-specific environmental analysis. *TABLE E-3—CURRENT AMOUNT OF OLD GROWTH BY COVER TYPE IN THE ANALYSIS AREA COMPARED TO MINIMUM-RETENTION LEVELS USING THE METHODOLOGY DEVELOPED IN THE BIODIVERSITY GUIDANCE FOR THE SFLMP* shows that approximately 37,765 acres, or 38% of the analysis area, are currently considered old growth. Historic data from the Upper Flathead Valley indicates that old-growth stands occupied

approximately 29% of the area. Proportions of old-growth acres on Stillwater State Forest exceed the one-half historic commitment in all cover types with the exception of the ponderosa pine cover type, which is approximately 83 acres below the minimum.

DESCRIPTION OF CURRENT DISTRIBUTION OF OLD-GROWTH STANDS ON STILLWATER STATE FOREST

TABLE E-3—CURRENT AMOUNT OF OLD GROWTH BY COVER TYPE IN THE ANALYSIS AREA COMPARED TO MINIMUM-RETENTION LEVELS USING THE METHODOLOGY DEVELOPED IN THE BIODIVERSITY GUIDANCE, column 3, shows that the analysis area has approximately 2.3 times as many old-growth acres as DNRC has committed to retain in the analysis area. In an effort to ensure that the old-growth that provides habitat for old-growth-associated species is maintained, the analysis also looks at the spatial arrangement of the old growth; this is helpful for developing and refining alternatives on the project level, as well as analyzing the effects of a proposed action. The current combination of old-growth stands can be viewed as a whole to help in planning. We fully expect that future project-level development, new information, and more extensive on-the-ground reviews of stands that currently are being identified as old growth may alter the current combination of old-growth stands on Stillwater Unit. Stillwater Unit has initiated planning concepts for developing an old-growth network. Review of the network process is ongoing and mapping of a network would not be completed until a later date.

Timber stands that currently meet DNRC's working definition of old growth on the main block of Stillwater State Forest are, in general, well distributed from north to south and east to west *(see Figure E-3—Stillwater State Forest Old-Growth Analysis Area Map)*. Connectivity from north to south is, generally, continuous. The exception is a gap in the upper reaches of the Stillwater River drainage where a sizeable patch of lodgepole pine was established following a large fire in the 1920s. This patch of lodgepole pine separates some of the northernmost old-growth stands from the rest of the forest's old growth.

The following proportions of old-growth stands are found in the following ranges of elevation:

- 37 percent at 3,000 to 3,900 feet
- 26 percent at 4,000 to 4,900 feet
- 22 percent at 5,000 to 5,900 feet
- 15 percent at 6,000 to 7,000 feet

The largest contiguous blocks of old-growth stands are in the Swift Creek drainage. These have a higher proportion of the western white pine, subalpine fir, and mixed-conifer cover types than those located in the Stillwater River drainage. The Stillwater River drainage old-growth stands have a higher proportion of the western larch/Douglas-fir cover types. Generally, old growth on the west side of Stryker Ridge is more scattered compared with the east side.

The old-growth stands with the densest stocking level, in terms of merchantable timber volume, are in the mixed-conifer and western larch/Douglas-fir cover types. The old-growth stands with the largest dbh are in the mixed-conifer and western larch/Douglas-fir cover types, with some stands having an average dbh of 22 to 26 inches. The largest individual old-growth stands are from 300 to 334 acres in size and, currently, are made up of mixed-conifer and western white pine cover types.

Stands that consisted of predominantly western red cedar

FIGURE E-3

STILLWATER STATE FOREST OLD-GROWTH ANALYSIS-AREA MAP

were, historically, located in and along riparian areas. The western red cedar cover type represented only minor amounts of the region *(Losensky, 1993)*. Because the western red cedar cover type is considered an important riparian vegetation type, the Stillwater State Forest's old-growth stands where western red cedar predominates were examined. Currently, 8 old-growth stands have a large percentage of western red cedar in the overstory, the largest stand being approximately 45 acres in size.

There is approximately 3,515 acres of timber stands that meet DNRC's minimum old-growth definition located within the analysis area on scattered sections north and west of the main block of Stillwater State Forest. These stand are comprised, primarily, of the western larch/Douglas-fir (73 percent) and mixed-conifer (18 percent) cover types. Most of these stands are at the lower elevations between 2,500 and 4,400 feet. These stands are on scattered parcels of State ownership; the largest individual stand is approximately 199 acres. The State ownership on these scattered sections is, generally, on warmer drier sites than most of the analysis area and contains the bulk of the analysis area's ponderosa pine cover types, including 188 acres of old growth.

OLD-GROWTH ATTRIBUTES IN THE TAYLOR SOUTH AREA

Background

DNRC has recognized that to ensure the appropriate range of conditions in regard to old-growth is kept, the naturally occurring range of attribute levels that are represented by the old-growth amounts needs to be determined. DNRC has developed an index of old-growthness to address some problems associated with old-growth definitions *(Supplemental Biodiversity Guidance: Old-Growth Management on School Trust Lands, August 2000)*.

Approximately 1/3 of the acres on Stillwater Unit has an updated SLI database that can assess these attribute levels. Guidelines that utilize this information at a landscape level have not been developed by DNRC at this time. The analysis presented is for information purposes and was completed at the project-level scale.

Methods

Most of the project area has updated SLI data that includes information needed to analyze old-growth attributes. For this project, the *STWOGI_00 database* has information on all but 12 acres of the total 341 acres where old-growth is proposed for harvesting. The 12 acres are part of 2 stands; inventory updates were made on these 2 stands.

Analysis Area

This section will display the current conditions of old-growth stands in the Taylor South Timber Sale Project area in relation to the proposed harvest areas.

OLD-GROWTH INDEX

The index supplies the ability to apply a quantitative definition of old-growth, but does not, in and of itself, propose one. The primary purposes of the index is to describe the status of old growth on DNRC lands and provide a link to naturally occurring amounts and conditions of old growth. This index, the Full Old-Growth Index (FOGI), is a means to measure old-growth levels based upon a point system for attributes often associated with stands in the latter stages of development.

Attributes that often characterize stands in the latter stages of development include:

- stocking level (volume per acre)

- tree vigor/decadence
- stand structure
- snags per acre
- coarse woody debris
- large live trees

An assessment of these attributes in relation to those old-growth stands with proposed treatment activities follows.

TABLE E-4–FOGI CLASSIFICATIONS BY COVER TYPES FOR THE TAYLOR SOUTH PROJECT AREA displays the FOGI classifications by cover type within the project area, followed by *TABLE E-5–FOGI CLASSIFICATION WITHIN PROPOSED HARVEST AREAS*, which describes the FOGI classifications by SLI stands.

OLD-GROWTH COMMITMENTS DIRECT EFFECTS

- ***Direct Effects Common to All Alternatives***

  During the short term, fire-suppression efforts would likely maintain the existing old-growth structure.

- ***Direct Effects of No-Action Alternative A***

  The amount, character, and distribution of existing old-growth stands would remain the same within the project area for the short term. Existing cover types would change, over time, with natural plant succession.

TABLE E-4 - FOGI CLASSIFICATIONS BY COVER TYPES FOR THE TAYLOR SOUTH PROJECT AREA

COVER TYPE	ACRES OF LOW ATTRIBUTE LEVELS	ACRES OF MEDIUM ATTRIBUTE LEVELS	ACRES OF HIGH ATTRIBUTE LEVELS	ACRES WITHOUT COMPLETE FOGI LEVELS	TOTAL ACRES
Alpine fir		14			14
Mixed conifer		381	328	28	737
Ponderosa pine			8*	23*	31
Western larch/ Douglas-fir	35	197	759	30	1,021
Western white pine	99	625	145*	36*	905
Totals	134	1,217	1,240	117	2,707

FOGI values were inventoried on 8 acres of ponderosa pine and 4 acres of western white pine cover types after the STWE_OGI database was produced.

TABLE E-5 - FOGI CLASSIFICATION WITHIN PROPOSED HARVEST AREAS

STAND IDENTIFICATION NUMBER	PROPOSED HARVEST UNIT NUMBER	TOTAL OG ACRES PROPOSED FOR HARVEST	FOGI		
			INDEX NUMBER	COVER TYPE AND CLASSIFICATION	
32220703	2,3,4	117	16	WWP	Medium
32220706	3	11	15	WWP	Medium
32220707	2	6	13	WWP	Medium
32220710	5	5	17	WWP	Medium
32221801	7,8,9	37	16	WWP	Medium
32221803	6	20	17	WWP	Medium
32221812	8	2	20	WWP	Medium
32221905	10	6	13	WWP	Medium
32221915	10	54	12	WWP	Low
32222001	11	29	22	WWP	High
32222002	11	10	19	MC	Medium
32222003	11	4	21	WWP	High
32222901	12	8	24	PP	High
32222903	12	11	16	WL/DF	Medium
32222909	12	4	17	WL/DF	Medium
32222912	13	4	22	MC	High
32223202	13	13	24	MC	High

- ***Direct Effects of Action Alternative B***

  The proposed harvest treatment would decrease the amount of old growth by 333 acres, while harvesting would take place within 341 acres of old growth. This is above the one-half minimum required by the SFLMP.

  Following implementation of Alternative B, the FOGI attribute classifications would be changed, as shown in *TABLE E-7—FOGI ATTRIBUTE CLASSIFICATION CHANGES (ALTERNATIVE B)*.

  Overall, the old-growth stands with:

  - low attribute levels would decrease 46 acres;
  - medium attribute levels would decrease 229 acres; and
  - high attribute levels would decrease 54 acres.

TABLE E-6 – CHANGES IN AMOUNT OF OLD GROWTH BY COVER TYPE IN THE ANALYSIS AREA THAT WOULD OCCUR IF ALTERNATIVE B WERE IMPLEMENTED

LOSENSKY TYPE	CHANGES IN OLD-GROWTH ACRES FOLLOWING IMPLEMENTATION	OVERALL CHANGE IN PERCENT OF OLD-GROWTH OVER MINIMUM RETENTION ACRES	EFFECTS COMPARED TO SFLMP MINIMUM ACRES OF OLD GROWTH ON STILLWATER UNIT
Ponderosa pine	0	N/A	83 (below)
Douglas-fir	0	N/A	222 (above)
Western larch/Douglas-fir	-15	0.1%	760 (above)
Lodgepole pine	0	N/A	3 (above)
Western white pine	-254	3.9%	5,339 (above)
Mixed conifer	-64	0.7%	6,926 (above)
Subalpine fir	0	N/A	8,154 (above)
Totals	-333	0.9%	

TABLE E-7 – FOGI ATTRIBUTE CLASSIFICATION CHANGES (ALTERNATIVE B)

COVER TYPE	FOGI CLASS	ACRES	CHANGES WITHIN PROJECT AREA
Mixed-conifer	Medium	-10 acres	No longer meet the old-growth definition
	High	-17 acres	
Ponderosa pine	High	-8 acres	Converted to low attribute value
Western larch/ Douglas-fir	Medium	-15 acres	No longer meet the old-growth definition
Western white pine	Low	-54 acres	
	Medium	-204 acres	
	High	-29 acres	

- ***Direct Effects of Action Alternative C***

  Harvesting would take place within 341 acres of old-growth stands, though the stands would continue to meet the current criteria in the DNRC old-growth definition. See *TABLE E-6—CHANGES IN AMOUNT OF OLD GROWTH BY COVER TYPE IN THE ANALYSIS AREA THAT WOULD OCCUR IF ALTERNATIVE C WERE IMPLEMENTED.*

  Following implementation of Alternative C, the FOGI attribute classifications would be changed as shown in *TABLE E-7 FOGI ATTRIBUTE CLASSIFICATION CHANGES (ALTERNATIVE C).*

  Overall, the old-growth stands with:

  - low attribute levels would increase 283 acres;
  - medium attribute levels would decrease 229 acres; and
  - high attribute levels would decrease 54 acres.

TABLE E-8 – CHANGES IN AMOUNT OF OLD GROWTH BY COVER TYPE IN THE ANALYSIS AREA THAT WOULD OCCUR IF ALTERNATIVE C WERE IMPLEMENTED

LOSENSKY TYPE	CHANGES IN OLD-GROWTH ACRES FOLLOWING IMPLEMENTATION	OVERALL CHANGE IN PERCENT OF OLD-GROWTH ACRES OVER MINIMUM RETENTION ACRES	EFFECTS COMPARED TO SFLMP MINIMUM ACRES OF OLD GROWTH ON STILLWATER UNIT
Ponderosa pine	0	N/a	83 (below)
Douglas-fir	0	N/a	222 (above)
Western larch/ Douglas-fir	+27	0.2%	802 (above)
Lodgepole pine	0		3 (above)
Western white pine	+37	0.6%	5,633 (above)
Mixed conifer	-64	0.8%	6,926 (above)
Subalpine fir	0	N/A	8,154 (above)
Totals	0	0.0%	

TABLE E-9 – FOGI ATTRIBUTE CLASSIFICATION CHANGES (ALTERNATIVE C)

COVER TYPE	FOGI CLASS	ACRES	CHANGES WITHIN PROJECT AREA
Mixed conifer	Medium	-10 acres	Direct conversion to low-attribute western larch/Douglas-fir cover type
	High	-17 acres	Direct conversion to low-attribute western larch/Douglas-fir cover type
Ponderosa pine	High	-8 acres	Conversion to low-attribute level
Western larch/ Douglas-fir	Low	+32 acres	
	Medium	-15 acres	Conversion to low-attribute level
Western white pine	Low	+233 acres	
	Medium	-204 acres	Conversion directly to low-attribute level
	High	-29 acres	Conversion directly to low-attribute level

OLD-GROWTH COMMITMENTS INDIRECT EFFECTS

- ***Indirect Effects Common to all Alternatives***

  Continued fire suppression would increase the risk of stand-replacement-type fires that would likely consume portions of the old growth in its path.

  Existing open roads would continue to provide access to firewood gatherers, reducing the development of snags and coarse woody debris on those sites.

- ***Indirect Effects to No-Action Alternative A***

  Over time and barring large-scale disturbances, FOGI classification levels would increase to a "high" rating on most cover types.

- ***Indirect Effects Common to Action Alternatives B and C***

  Harvesting within any old-growth stands may lower the likelihood that those stands, or portions of stands, would be managed for old-growth over the long term or be a part of an old-growth network.

OLD-GROWTH COMMINTMENTS CUMULATIVE EFFECTS

- ***Cumulative Effects Common to all Alternatives***

  Assuming all timber sales listed in Appendix A are harvested, there would be additional or cumulative effects to old-growth acreages from those listed in the STWE_OGI database. The old-growth inventory data listed in STWE_OGI database are from field-inventoried stands and are updated annually. These updates are not concurrent with DNRC's harvesting activities, nor do they account for estimations made in EAs and EISs. Cumulative acreages, as listed in *TABLE E-10—CUMULATIVE ACRES OF OLD GROWTH FOR THE TAYLOR SOUTH TIMBER SALE PROJECT AND NO-ACTION ALTERNATIVE, TABLE E-11-CUMULATIVE EFFECTS TO ACRES OF OLD GROWTH BY COVER TYPE IN RELATION TO ACTION ALTERNATIVE B,* and *E-12—CUMULATIVE EFFECTS TO ACRES OF OLD GROWTH BY COVER TYPE IN RELATION TO ALTERNATIVE C (following pages)* will account for the difference between STWE_OGI information and those sales listed in Appendix A.

  It may be important to note that timber stands, whether harvested within or not, may be reinventoried and reindexed in regard to adjustments in stand boundaries and may change the old-growth status.

  Past road construction, timber sales, wildfires, and general site characteristics have led to the current amount of old-growth characteristics in the entire area. Future sales and thinning projects would likely continue to take place in the analysis area. If additional management projects were proposed, the MEPA process would be implemented.

- ***Cumulative Effects to No-Action Alternative A***

TABLE E-6 - CUMULATIVE ACRES OF OLD GROWTH FOR THE TAYLOR SOUTH TIMBER SALE PROJECT AND NO-ACTION ALTERNATIVE

LOSENSKY TYPE	MINIMUM OLD-GROWTH RETENTION ACRES	CURRENT OLD-GROWTH ACRES (STWE_OGI)	CHANGE IN CUMULATIVE ACREAGES (APPENDIX A)	CUMULATIVE ACREAGES	EFFECTS COMPARED TO SFLMP MINIMUM ACRES OF OLD GROWTH ON STILLWATER UNIT
Ponderosa pine	302.5	219.4	0	219	83 (below)
Douglas-fir	50.7	272.9	0	273	222 (above)
Western larch/ Douglas-fir	10,530.2	11,304.8	-74	11,231	701 (above)
Lodgepole pine	250.4	253.3	0	253	3 (above)
Western white pine	771.3	6,367.4	-63	6,304	5,533 (above)
Mixed conifer	1,911.3	8,900.8	-298	8,603	6,692 (above)
Subalpine fir	2,289.8	10,492.2	-48	10,444	8,154 (above)
Totals	16,106.2	37,810.8	483	37,327	

- ***Cumulative Effects to Action Alternative B***

TABLE E-7 - CUMULATIVE EFFECTS TO ACRES OF OLD GROWTH BY COVER TYPE IN RELATION TO ACTION ALTERNATIVE B

LOSENSKY TYPE	MINIMUM OLD-GROWTH RETENTION ACRES	CUMULATIVE ACREAGES	EFFECTS OF ACTION ALTERNATIVE B	CUMULATIVE EFFECTS INCLUDING ACTION ALTERNATIVE B	EFFECTS COMPARED TO SFLMP MINIMUM ACRES OF OLD GROWTH ON STILLWATER UNIT
Ponderosa pine	302.5	219	0	219	83 (below)
Douglas-fir	50.7	273	0	273	222 (above)
Western larch/ Douglas-fir	10,530.2	11,231	-15	11,216	686 (above)
Lodgepole pine	250.4	253	0	253	3 (above)
Western white pine	771.3	6,304	-254	6,050	5,279 (above)
Mixed conifer	1,911.3	8,603	-64	8,539	6,628 (above)
Subalpine fir	2,289.8	10,444	0	10,444	8,154 (above)
Totals	16,106.2	37,327	-333	36,994	

- ***Cumulative Effects to Action Alternative C***

TABLE E-8 - CUMULATIVE EFFECTS TO ACRES OF OLD GROWTH BY COVER TYPE IN RELATION TO ALTERNATIVE C

LOSENSKY TYPE	MINIMUM OLD-GROWTH RETENTION ACRES	CUMULATIVE ACREAGES	EFFECTS OF ALTERNATIVE C	CUMULATIVE EFFECTS INCLUDING ALTERNATIVE C	EFFECTS COMPARED TO SFLMP MINIMUM ACRES OF OLD GROWTH ON STILLWATER UNIT
Ponderosa pine	302.5	219	0	219	83 (below)
Douglas-fir	50.7	273	0	273	222 (above)
Western larch/ Douglas-fir	10,530.2	11,231	+27	11,258	728 (above)
Lodgepole pine	250.4	253	0	253	3 (above)
Western white pine	771.3	6,304	+37	6,341	5,570 (above)
Mixed conifer	1,911.3	8,603	-64	8,539	6,628 (above)
Subalpine fir	2,289.8	10,444	0	10,444	8,154 (above)
Totals	16,106.2	37,327	0	37,327	

APPENDIX F

WILDLIFE

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX F

WILDLIFE

INTRODUCTION

DNRC recognizes that it is not possible to evaluate the effects of proposed actions on all wildlife species and their specific habitats within any given project area. DNRC assumes that if natural landscape patterns and processes are there, the full compliment of species would be maintained across the landscape. Under the SFLMP, DNRC manages State trust lands to maintain and restore a semblance of historic conditions and make reasonable attempts to engage in cooperative planning efforts with major adjacent landowners *(DNRC 1996)*. This coarse-filter approach supports diverse populations of wildlife by managing for a variety of forest structures and compositions across a landscape.

DNRC acknowledges the difficulty of ensuring that a broad view, such as that taken under the coarse filter, adequately considers all of the important components that may be affected by any given project. Therefore, using a fine filter, DNRC also evaluates individual species and habitats that are known to be sensitive to various forms of habitat alteration and/or human-caused disturbances. These typically include species Federally listed as threatened or endangered, species considered sensitive by DNRC, and big game species managed by Montana DFWP. The cumulative effects of past and ongoing disturbances to habitat will be discussed under the fine-filter approach.

The effects of No-Action Alternative A and Action Alternatives B And C are addressed relative to the existing condition of the proposed project area. The effects of the alternatives on wildlife habitat at the landscape level and the cumulative effects of other ongoing and proposed projects across ownership boundaries are discussed. No specific projects were identified on Plum Creek Timber Company or USFS lands.

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METHODS

The assessment of the existing conditions and the environmental consequences of the proposed project and adjacent areas used information obtained from:

- field visits, track surveys, and silvicultural plots
- recent scientific literature
- SLI data
- aerial photos
- consultations with natural resource managers, including biologists, foresters, and an entomologist

COARSE-FILTER ASSESSMENT

OVERVIEW

The entire assemblage of terrestrial vertebrates native to Stillwater State Forest at the time of European settlement likely still occur presently. This includes the large carnivores often displaced by human disturbance such as the grizzly bear, lynx, wolf, and wolverine. Species that rely on special habitat elements, such as white bark pine, western white pine, or burned areas may not be present or are in decline due to the lack of these elements across the landscape.

Wildlife habitats on the main block of Stillwater State Forest benefit from surrounding areas managed by FNFthat are relatively undisturbed. Other adjacent or surrounding private industrial forests have been harvested intensively, benefiting wildlife species that can use early seral stages either exclusively or seasonally.

Human activity, generally recreational activity, on Stillwater State Forest ranges from high along the Lower Whitefish Road to moderate along the high elevation of Whitefish Divide and Stryker Ridge of the Whitefish Mountains. Dispersed and locally concentrated recreation and timber harvesting are the primary human activities that, directly and indirectly, have affected and will affect wildlife.

TIMBER HARVESTING

Timber harvesting activities have occurred on Stillwater State Forest for several decades. Early timber harvesting, connected with railroad ties and mine timbers, concentrated on large, usually seral, tree species, such as western larch and, to a limited extent, ponderosa pine. Recent timber-harvesting activities have, through regeneration or seedtree harvests, promoted western larch and, to a limited extent, ponderosa pine. Selective harvesting, leaving 25 to 50 percent of existing trees, has also occurred. Snag retention and recruitment have been considered in managing timber recently on Stillwater State Forest.

OTHER TIMBER-HARVESTING PROJECTS UNDER CONTRACT

Timber sale projects that are in progress on Stillwater State Forest are listed in *APPENDIX A—LIST OF RELATED ENVIRONMENTAL REVIEWS;* this includes the Chicken/Werner Timber Sale Project in Sections 19, 20, 29, 30, 32, and 33, T33N, R22W, which is adjacent to, and directly north of, the proposed Taylor South Timber Sale Project area. The Chicken/ Werner Timber Sale Project will harvest from 895 to 1,262 acres, depending on whether the optional helicopter units are harvested. An estimated 592 acres of old-growth mixed-conifer, western white pine, and subalpine fir cover types may be harvested. Approximately 367 of the 592 old-growth acres would not meet DNRC minimum old-growth definitions following harvesting. The largest impacts to wildlife are reductions in lynx denning habitat, grizzly bear hiding cover, and pileated woodpecker and boreal owl nesting habitats. Hiding cover within the Lazy Creek Grizzly Bear Subunit would be reduced by 1,262 acres, resulting in 13,393 acres of hiding cover within the subunit after completion of the Chicken/Werner Timber Sale Project. There would be no long-term increase in the percent of the subunit with open- or total-road densities higher than the 1996 levels. The percentages of the subunit with greater than 2 miles of total road per square mile of land and greater than 1 mile of open road per square mile of land would both increase 1 percent during project activities and revert to existing

levels following completion of the project.

OTHER TIMBER-HARVESTING PROJECTS UNDER CURRENT CONSIDERATION

The Good/Long/Boyle Timber Sale Project is now being prepared for Land Board consideration. The timber sale proposal is located in Sections 17, 19, 27, 28, 29, 30, 31, 32, and 33, T32N, R23W, and Section 1, T31N, R24W. Approximately 5 MMBF of timber are proposed to be harvested from 1,207 acres. Approximately 190 acres of all age classes, including 55 acres of old-growth, would be changed directly to the 0-39-year age class. Four harvest units are within the Lazy Creek Grizzly Bear Subunit, and hiding cover would be reduced by 597 acres, resulting in 12,796 acres of hiding cover within the subunit after completion of the proposed project. There would be no long-term increase in the percentage of the subunit with open- or total-road densities higher than the 1996 levels. The percent of the subunit with greater than 2 miles of total road per square mile of land and greater than 1 mile of open road per square mile of land would both increase 1 percent during project activities and revert to existing levels following completion of the project.

OTHER TIMBER-HARVESTING PROJECTS IDENTIFIED ON 3-YEAR SALE PLAN

Two proposed timber-harvesting projects are on the DNRC NWLO 3-year sale plan:

- the West Fork Swift Creek Timber Sale Project proposes to harvest in T34, R23W and/or R24W.
- the Dog/Meadow Timber Sale Project proposes to harvest in T33N, R23W.

The road construction needs and amount of harvesting within particular cover types and age classes have not been identified for either proposed project. Although the West Fork Swift Creek Timber Sale Project is within the Upper Whitefish Grizzly Bear Subunit, no increases should occur in open- or total-road densities due to the proposed project. It is presently unknown whether the Dog/Meadow Timber Sale Project would increase open- or total-road densities.

INFLUENCE OF FIRE

The influence of fire has been reduced across the northern Rocky Mountains, including most of western Montana. Modern fire-suppression techniques have been effective for at least 50 years. However, the relatively cool, moist climate of Stillwater State Forest generates habitat types where mixed-severity and stand-replacing fire regimes are the normal disturbance factor occurring at intervals of 50 to 250 years. In certain areas of Stillwater State Forest, the intervals are longer. The climate has reduced the effect of fire suppression to some extent; however, fire-dependent species, such as the black-backed woodpecker *(Picoides arcticus)*, are affected by the lack of natural fire regimes over the broader landscape, including the Stillwater State Forest.

STAND-AGE AND COVER-TYPE CHARACTERISTICS

Mature and old-growth stands are essential habitat for wildlife species associated with the late seral stages of forest stand development for all or some life requirements. A partial list of these species includes pileated woodpeckers, pine marten, brown creepers, and red-backed voles. The 5,040- acre proposed project area currently contains 1,489 acres of mature (100 to 149 years old) and 2,062 of old-growth (more than 150 years old) stands with at least 40

percent canopy closure levels of mature trees (more than 9 inches dbh). A majority of these stands are currently western larch\Douglas-fir, western white pine, and mixed-conifer cover types.

Direct Effects to Stand-Age and Cover-Type Characteristics

- ***Direct Effects of No-Action Alternative A***

  Under No-Action Alternative A, the existing distribution of age classes would be retained if natural disturbances such as wildfires, insect infestations, or wind events do not occur.

- ***Direct Effects Common to Action Alternatives B and C***

  In Action Alternatives B and C, 341 acres of old-growth stands would be harvested. The acreage and current cover types of the old-growth proposed for harvesting includes:

  - 254 acres of western white pine,
  - 64 acres of mixed conifer,
  - 15 acres of western larch \Douglas-fir, and
  - 8 acres of ponderosa pine.

  The proposed project would harvest 261 acres of mature (100 to 149 years old) stands in Alternative B, and 265 acres of mature stands in Alternative C. Certain wildlife species that use mature to old stands, such as pileated woodpeckers and other cavity-nesting bird species, would not benefit from habitat alteration caused by the proposed project.

Indirect Effects to Stand Age and Cover Type Characteristics

- ***Indirect Effects of No-Action Alternative A***

  Cover-type representation would continue to shift toward those cover types dominated by shade-intolerant tree species such as grand fir, subalpine fir, and Engelmann spruce.

- ***Indirect Effects Common to Action Alternatives B and C***

  Wildlife species that use early seral stages of forest stand development for all or some life requirements would benefit by the proposed project within the harvested areas.

Cumulative Effects to Stand Age and Cover Type Characteristics

Cumulative Effects Common to Action Alternatives B and C

If Action Alternative B or C were chosen, additional treatments would be cumulative to past harvests in the project area, the entire Stillwater State Forest, and adjacent ownerships in their effects on wildlife. Should the amount of old-growth forest be below the range naturally occurring across the Swift Creek drainage and adjacent mountain ranges, further reductions of existing old-growth proposed under Action Alternatives B and C may be detrimental for some old-growth-associated species. Species that do not use old-growth for some or all life requirements would be unaffected by or would benefit from the proposed project.

SPECIAL HABITATS

According to the GIS database, approximately 22 miles of perennial streams are within the project area. In western Montana, 85 percent of

all bird species use riparian areas, which comprise 1 percent of the land. Half of those bird species, or 40 to 45 percent of all birds are restricted to riparian areas for breeding purposes *(Mosconi and Hutto, 1982)*. Also, birch and black cottonwoods occur in numerous seeps and springs. No avalanche chutes, meadows, rock outcrops, or cliffs are within the project area.

Direct Effects to Special Habitats

- ***Direct Effects to No-Action Alternative A***

  The riparian plant communities along, approximately, 22 miles of intermittent and perennial streams within the project area would not be affected by this alternative. Paper birch *(Betula papyrifera)* and black cottonwood *(Populus trichocarpa)* occur in the many seeps and\or springs. These areas would also remain unaffected under this alternative. Therefore, the wildlife species associated with these riparian areas would not be affected under this alternative.

- ***Direct Effects Common to Action Alternatives B and C***

  The riparian plant communities along, approximately, 22 miles of intermittent and perennial streams within the project area would be protected by 165-foot buffers on each side of the stream that are intended to maintain resting sites and travel corridors for fisher. Approximately 2 acres on Vars Creek would be harvested within the fisher riparian buffer, although a 50-foot SMZ buffer would be required. Paper birch and black cottonwood would continue to occur within these buffers.

Indirect Effects to Special Habitats

- ***Indirect Effects to No-Action Alternative A***

  Riparian areas would continue to move toward more shade-tolerant tree species such as grand fir *(Abies grandis)* and Engelmann spruce *(Picea engelmannii)*.

- ***Indirect Effects Common to Action Alternatives B and C***

  Approximately 1,412 acres of unharvested fisher riparian buffers within the Lazy Creek Grizzly Bear Management Subunit would continue to move toward the more shade-tolerant species, such as grand fir and Engelmann spruce.

Cumulative Effects to Special Habitats

Cumulative Effects Common to Action Alternatives B and C

Other timber sales on Stillwater State Forest include the active Chicken/Werner Timber Sale Project and the proposed Good-Long-Boyle Timber Sale Project. Both projects intend to leave 165-foot buffers on perennial streams and 83-foot buffers on intermittent streams as fisher habitat. The riparian plant communities on Stillwater State Forest would remain largely intact, as the cumulative effects of several proposed and active projects would be negligible. Riparian plant communities on Federal land are also unaffected by land management. Adjacent private landowners may have more impact on riparian plant communities, although all landowners are subject to SMZ regulations.

FINE-FILTER ASSESSMENT

THREATENED AND ENDANGERED SPECIES

- **Bald eagle *(Haliaeetus leucocephalus)***

The bald eagle was recently proposed for delisting from threatened species status under the Endangered Species Act *(Federal Register, Volume 64: Numbers 128, 169)*. The bald eagle was listed an endangered species in most of the lower 48 states, including Montana, in 1978. The Pacific recovery region, which includes Montana, came under the jurisdiction of the *Recovery Plan for the Pacific Bald Eagle* in 1986. This project was designed in accordance with the *Montana Bald Eagle Management Plan* and *Habitat Management Guide for Bald Eagles in Northwestern Montana*. The *Report on the Whitefish Lake Bald Eagle Territory and the Upper Whitefish Lake Bald Eagle Territory Site-Specific Management Guidelines (Paige 1991, Paige 1997)* were the main sources of site-specific information used. DNRC will consider the bald eagle to be a sensitive species for, at least, the duration of the 5-year postdelisting monitoring period.

Bald eagles are diurnal raptors associated with significant water bodies, such as rivers, lakes, and coastal zones. The bald eagle diet consists primarily of fish and waterfowl, but includes carrion, mammals, and items taken from other birds of prey. In northwestern Montana, bald eagles begin the breeding process with courtship behavior and nest building in early February; the young fledge by approximately mid-August, ending the breeding process. Preferred nest-stand characteristics include large emergent trees that are within site distance of lakes and rivers and screened from disturbance by vegetation.

Whitefish Lake bald eagle territory

The Whitefish Lake bald eagle territory (007-034) is located on the north end of Whitefish Lake in northwest Montana (T31N and T32N, R22W). Biologists and residents have recorded bald eagle nesting activities near Whitefish Lake since 1984. One pair is probably responsible for the majority of the recorded nesting activity for the last several years; bald eagles can live for decades and it is believed pair bonding is long-term.

The aquatic habitat associated with the Whitefish Lake territory contains several water bodies. The principal water bodies are Whitefish Lake (approximately 6 miles long and 1 mile wide; 3,850 acres), Smith Lake (approximately 0.3 miles long; 16 acres), Lazy Creek, and Swift Creek (main stem is approximately 22 miles long). Many tributaries, small wetlands, and beavers ponds are within the Whitefish Lake territory home range. Also, several bodies of water are located just outside the home-range boundary, which include Beaver, Boyle, Dollar, Little Beaver, Murray, Rainbow, Thornberg, and Woods lakes. Perching eagles have been sighted at Boyle Lake and the adjacent beaver ponds *(Paige 1991)*. These waterbodies may be important components of the actual home range within the Whitefish Lake bald eagle territory, just as the high elevation, less vegetated portions of the Whitefish range may be of lesser importance.

The aquatic habitat prey base is primarily composed of fish and waterfowl species, but also mammals, such as beaver and muskrat. Waterfowl tend to congregate at the inlets of Swift

and Lazy creeks, which may be ice-free when Whitefish Lake is frozen *(Paige 1991)*. Fish species that grow large enough for use by bald eagles and occur in the more accessible shallow areas of Whitefish Lake include lake trout, lake whitefish, and northern pike *(Paige 1991)*. Westslope cutthroat trout, squawfish, peamouth, large scaled sucker, long-nosed sucker, and yellow perch are also common species in the lakes and streams within the general area, while kokanee, mountain whitefish, and brook trout are less common *(Paige 1991)*. Eagles have been observed carrying food to nest sites from Whitefish Lake on 3 occasions and from Swift Creek on 1 occasion *(Paige 1991)*. Fifty percent of the extended flights during the breeding period, which are assumed to be associated with foraging, were over Whitefish Lake, 10 percent were up Swift Creek, and 40 percent were in unknown areas *(Paige 1991)*.

The terrestrial habitat incorporated by the Whitefish Lake bald eagle territory is a coniferous/deciduous mixture along the lakeshores and streambanks with coniferous forest in the upland areas. Within the present home range, black cottonwood is the deciduous tree of primary importance to bald eagles; nests 01, 02, and 03 were in black cottonwood trees. Coniferous tree species within the Whitefish Lake bald eagle territory include western larch *(Larix occidentalis)*, western hemlock *(Tsuga heterophylla)*, western red cedar *(Thuja plicata)*, grand fir, subalpine fir *(Abies lasiocarpa)*, Douglas-fir *(Pseudotsuga menziesii)*, and ponderosa pine *(Pinus ponderosa)*. Large ponderosa pine trees, such as the one that holds the current nest, occur in the Douglas-fir or Douglas-fir\western larch cover types in the Taylor-South Timber Sale Project area. These 2 cover types, combined with the mixed-conifer cover type, comprise 100 percent of the nest site and primary use areas.

Foraging opportunities within the terrestrial habitats include carrion, ground squirrels, and robbing nests of other raptors. Carrion would primarily be white-tailed or mule deer, elk, or moose remains from winterkill, human-caused mortality, or predation activity by wolves, bears, and mountain lions. *Paige (1991)* reports incidental sightings of eagles foraging on carrion and ground squirrels in pastures and meadows along the north end of Whitefish Lake.

Four nests have been associated with this territory since observations were first recorded in 1984; 3 have been on lower Swift Creek near Whitefish Lake, and the active nest is also near the northern end of Whitefish Lake. The active nest has an associated nest site area (400-meter-radius) entirely within the Stillwater State Forest *(MBEWG 1991, MBEWG 1994)*. This nest produced and fledged at least 1 young in 1999, and had at least 2 nestling as of July 14, 2000. The 400-meter-radius, or 0.25-mile, nest area (approximately 125 acres) is composed of 3 stands, which are all greater than 150 years old. The largest portion of the nest area (75 acres) is a stand that is currently classified as a mixed-conifer cover type and western larch/Douglas-fir stand as an appropriate condition *(Losensky, SFLMP)*. The remaining portion of the nest area (approximately 50 acres) is currently and appropriately classified as a western larch/ Douglas-fir cover type. Timber harvesting occurred in the nest

area prior to nest relocation from Swift Creek. Firewood cutting and recreation presently occur within the nest area. Stand health is acceptable, although bark beetles, windthrow, and firewood cutting were recognized as potential problems within these stands a decade ago *(Paige 1991)*. Some bark beetle activity presently occurs within the nest area.

Approximately 80 percent of the 800-meter, or 0.5-mile, radius primary-use area is also within Stillwater State Forest; the remaining portion of the primary-use area is on private property (nonindustrial forestlands). Development in the form of private residences has occurred or is occurring on the privately owned land within the primary-use area. State-owned forest stands within the primary-use area, but not within the nest area, are in relatively good condition, but do not contain large, emergent trees with broad crowns suitable for nesting *(Paige 1991)*.

The 4-kilometer-radius, or 2.5-mile, home range is located on Stillwater State Forest, FNF, Plum Creek Timber Company, and other private lands. Various levels of timber harvesting, residential development, and recreation are occurring within the prescribed home range. Features within the home range that are significant to bald eagle life requirements include perching and roosting trees on Whitefish Lake and Swift Creek and the DFWP-designated white-tailed deer winter range and its associated carrion.

Upper Whitefish Lake bald eagle territory

The Upper Whitefish Lake bald eagle territory is within the "disjunct" project area. The Upper Whitefish Lake bald eagle pair was last known to produce offspring in 1998, and have produced 3 nestlings of unknown fate and 8 fledglings since 1984 *(Paige 1997)*. The primary use area has been delineated based on 3 years of observations; the general shape is 0.3 miles from the north and south ends of Upper Whitefish Lake, with a 0.2-mile corridor on the west side of the lake, and negligible acreage east of the lake. Upper Whitefish Lake, Red Meadow Lake, and the East Fork of Swift Creek are the principal areas of use within the Upper Whitefish Lake bald eagle territory.

Direct Effects to the Bald Eagle

- ***Direct Effects of No-Action Alternative A***

Whitefish Lake Bald Eagle Territory

No additional effects to bald eagles would be expected.

Upper Whitefish Lake Bald Eagle Territory

No additional effects to bald eagles would be expected.

- ***Direct Effects of Action Alternatives B and C***

Whitefish Lake Bald Eagle Territory

No harvesting activity is proposed within the 400-meter-radius (0.25-mile) nest area of the Whitefish Lake bald eagle territory. Therefore, this project would have no direct affect on the nest area.

Approximately 8 to 10 acres of a 24-acre improvement harvest would occur within the 800-meter-radius (0.5-mile) primary use area. The harvesting activity would remove:

- shade-tolerant species such as grand fir, and
- some larger western white pine infected with blister rust, an

exotic rust that eventually kills a majority of individual western white pine trees.

Seral species, such as western larch and ponderosa pine of all sizes, would be retained to provide present and future large emergent trees for perching and roosting habitat. Vegetative screening would be retained to some extent. Harvesting activity would occur between August 15 and February 15, the nonnesting period. The harvest is not located within the well-used flight path between the nest and Whitefish Lake and/or Swift Creek; nor is it located between the nest and Smith Lake, another water body where eagles from this nest have been observed.

Within the 4-kilometer-radius (2.5-mile) home range of the Whitefish bald eagle territory there is (in addition to the 8 to 10 acres within the 800-meter-radius primary use area) approximately 142 acres of harvesting activity proposed. The proposed units within 1 mile of the nest would be harvested between August 15 and February 1 (the nonnesting period). This would further reduce the possibility of disturbance to the nest from the proposed Taylor South Timber Sale Project.

No perching or roosting trees near Smith Lake or Swift Creek would be harvested by the proposed project. All harvesting activity would take place at a minimum of 165 feet from Swift Creek.

These mitigating actions conform to management guidelines recommended in the *Habitat Management Guide for Bald Eagles in Northwestern Montana (MBEWG 1991)* and address management issues raised in *The Report on the Whitefish Lake Bald Eagle Territory (Paige 1991)*. Incomplete adherence may jeopardize the ability of bald eagles to occupy and reproduce within this bald eagle territory.

Upper Whitefish Lake Bald Eagle Territory

No activity is proposed within the 400-meter-radius (0.25-mile) nest area of the Whitefish Lake bald eagle territory during the nesting period. This mitigating action conforms to management guidelines recommended in the *Habitat Management Guide for Bald Eagles in Northwestern Montana (MBEWG 1991)*. Incomplete adherence may jeopardize the ability of bald eagles to occupy and reproduce within this bald eagle territory.

Indirect Effects to the Bald Eagle

- ***Indirect Effects Common to All Alternatives***

Whitefish Lake Bald Eagle Territory

To the extent forest insects and diseases affect the current and potential nest stands, these stands could deteriorate in condition and become less suitable for bald eagle use *(Paige 1991)*. Management is neither encouraged or discouraged, merely the need to monitor stand health should be recognized.

Increasing recreational use, mainly vehicle traffic on open and closed forest spur roads near the nest site, may affect the use or productivity of this bald eagle territory.

Upper Whitefish Lake Bald Eagle Territory

No timber harvesting would occur within the disjunct project area; revenue from the proposed Taylor-

South Timber Sale Project would be used to replace a bridge on Upper Whitefish Road where it crosses Swift Creek (Section 28, T34N, R23W). The proposed bridge reconstruction is within the 400-meter-radius (0.25-mile) nest area and is the only proposed activity within the disjunct project area.

- ***Indirect Effects to No-Action Alternative A***

Whitefish Lake Bald Eagle Territory

To the extent that forest insects and diseases affect the current and potential nest stands, these stands could deteriorate in condition and become less suitable as bald eagle nesting habitat *(Paige 1991)*.

Upper Whitefish Lake Bald Eagle Territory

No indirect effects to bald eagles were identified.

- ***Indirect Effects to Action Alternatives B and C***

Whitefish Lake Bald Eagle Territory

The main effect of the harvest units within the 4-kilometer home-range radius on bald eagles would be the effect on the long-term viability of the resident white-tailed deer herd and its ability to continue to provide carrion to the Whitefish Lake bald eagle territory. This will be addressed in more detail within the big game portion of this document.

Upper Whitefish Lake Bald Eagle Territory

Road improvements may encourage an increasing number of vehicles to use Upper Whitefish Road. The effect of bridge reconstruction is probably negligible in this respect and would not affect the Upper Whitefish Lake bald eagle territory.

Cumulative Effects to the Bald Eagle

Whitefish Lake bald eagle territory

The limiting habitat feature within the Whitefish Lake bald eagle territory is potential nesting and perching habitat. The cumulative effects of past, present, and future residential development, timber harvesting, firewood gathering, and recreation may continue to reduce the available nest and perch trees of suitable diameter, crown type, and security level. On non-State land these cumulative impacts, which are not within the purview of DNRC, may continue to reduce the viability of this bald eagle territory.

Again, increasing recreational use, mainly vehicle traffic, on DNRC-owned open and closed forest spur roads near the nest site may increasingly affect the use or productivity of this bald eagle territory.

Upper Whitefish Lake bald eagle territory

No other known actions would affect this bald eagle territory, though increasing recreational use may.

➢ **Grizzly bear *(Ursus horribilus)***

Grizzly bears are listed as threatened species under the Endangered Species Act and are known to inhabit the project area, which lies within the Lazy Creek Bear Management Subunit of the North Continental Divide Ecosystem Recovery Area. Each subunit is approximately the size of the home range of a female grizzly bear. The land in theLazy Creek Bear Management Subunit, approximately 34,560 acres (54 square miles), belongs to:

- Plum Creek Timber Company (15,013 acres),

- DNRC (14,520 acres),
- FNF (4,008 acres), and
- other private landowners (1,020 acres).

There have been several recent sightings within the general vicinity of the project area that have occurred on:

- adjacent portions of Stillwater State Forest (generally to the north and west),
- adjacent portions of FNF, and
- on Plum Creek Timber Company land to the west of the project area.

Grizzly bears generally use different habitats relative to season. The Taylor South Timber Sale Project area is spring habitat with, primarily, low to moderate habitat values as modeled by Mace, et al *(in press)*. Spring habitat also occurs to the west and northwest of the project area in the central portion of the Lazy Creek Bear Management Unit. The project area has no, or very low, summer and fall habitat values. Adjacent high-elevation areas along the Whitefish Divide on FNF have low amounts of summer seasonal habitat with moderate value and significant amounts of fall habitat with moderate to high habitat values. Summer or fall habitat values are low, or not present, within the project area. Seasonal habitat values in areas adjacent to the project area range from spring habitat of moderate quality to fall habitat of moderate to high quality.

DNRC is committed to designing projects that result in no net increase from 1996 levels in the proportion of each BMU subunit with 1 mile per square mile of open roads and 2 miles per square mile of total roads. A moving-windows analysis shows that presently 71% of the Lazy Creek Bear Management Subunit has total road densities greater than 2 miles per square mile, and 46 percent of the Lazy Creek Bear Management Subunit has open road densities greater than 1 mile per square mile. An analysis of motorized access for 1996, when the interim guidance was adopted, showed 74 percent of the Lazy Creek Grizzly Bear Management Subunit has total road densities greater than 2 miles per square mile, and 50 percent of the Lazy Creek Bear Management Subunit has open-road densities greater than 1 mile per square mile.

DNRC is also committed to maintaining existing levels of security core on DNRC ownership within the North Continental Divide Ecosystem Recovery Area *(DNRC Interim Grizzly Bear Guidance, 10/6/95)*. According to the DNRC Interim Grizzly Bear Guidance, security core areas should be 0.3 miles from open roads or high-use trails. Security core areas are not necessarily roadless, but existing roads within security cores should be completely free of motorized access during the nondenning period, thus having effective closures. Security core areas also must have relatively low nonmotorized use. According to the DNRC Interim Grizzly Bear Guidance, security core areas do not need to meet the Federal security core definition that requires a minimum size of 2,500 acres and, once established, remain in place for at least 10 years. The security core comprises 14 percent of the State-owned portion of the Lazy Creek Grizzly Bear Management Subunit (12 percent of the entire subunit), and the 1995 baseline value for the State-owned portion is 13 percent. The amount of DNRC-owned security core is 1,337 acres with the Lazy Creek Grizzly Bear Management Subunit.

Grizzly bear hiding cover is defined as vegetation that will

hide 90 percent of a grizzly bear at a distance of 200 feet. The DNRC Interim Grizzly Bear Guidance commits to retention of 40 percent of the State-owned portion of a grizzly bear management subunit to be retained in hiding cover. Hiding cover across the subunit ranges from 40 to 60 percent on Plum Creek Timber Company property to 92 percent on State ownership. Within the Taylor South Timber Sale Project area, grizzly bear hiding cover occurs on 99.6 percent of the acreage. The portions of the subunit owned by Plum Creek Timber Company and the State has adequate hiding cover on 62 to 81 percent of its acreage. Hiding-cover values are unknown on the other private ownership.

Direct Effects to Grizzly Bear

- ***Direct Effects of No-Action Alternative A***

  No effects to grizzly bears would be expected. Grizzly bears using the project area for any type of life requirement would be under the lowest risk of mortality or disturbance caused by grizzly bear-human interactions under this alternative.

- ***Direct Effects of Action Alternatives B and C***

  Season of Activity

  The proposed project area is primarily spring habitat with low to moderate habitat values. The project area has no, or very low, summer and autumn habitat values. By limiting proposed harvesting on units that would use restricted roads to the period of July 1 to March 15, the end of the denning period, disturbance to grizzly bears would, potentially, be reduced during the period in the spring when bears would be more likely to use the proposed project area. Winter harvesting would result in no direct effects to known grizzly bear den sites.

  Open and Total Road Densities

  During current and proposed projects, open and total road densities would remain below the 1996 baseline levels *(TABLE F-1—PERCENT OF SUBUNIT AREA BY OPEN AND TOTAL ROAD DENSITY STATUS THROUGH PROJECTS PROPOSED FOR THE IMMEDIATE FUTURE)*. Restricted roads would be used during this proposed project and other active or proposed projects occurring during the same time period, although the proportion of the Lazy Creek Grizzly Bear Subunit that exceeds 1 mile per square mile of open-road densities, or 2 miles per square mile of total-road densities would remain below the 1996 baseline levels.

  Security Core

  Security core would not be entered or altered in either action alternative. The amount of DNRC-owned security core would remain at 1,337 acres (14 percent) within the subunit.

  Hiding Cover

  Hiding cover would be reduced by 638 acres in Alternative B and 632 acres in Alternative C. According to stand level inventory (SLI) grizzly bear hiding cover within the proposed project area would decline from 99.6 percent of the acreage to 84.5 percent (Alternative B) or 84.7 percent (Alternative C) of the acreage. (See *TABLE F-2 EXISTING AND FUTURE GRIZZLY BEAR HIDING COVER ON DNRC OWNERSHIP WITHIN THE LAZY CREEK BEAR MANAGEMENT SUBUNIT.)*

TABLE F-1 - PERCENT OF SUBUNIT AREA BY OPEN AND TOTAL ROAD DENSITY STATUS THROUGH PROJECTS PROPOSED FOR THE IMMEDIATE FUTURE

ANALYSIS UNIT	ROAD DENSITY STATUS	BASELINE LEVELS (2/96)	EXISTING LEVELS (3/00)	DURING TAYLOR SOUTH	DURING TAYLOR SOUTH AND GOOD/LONG/BOYLE
Lazy Creek Subunit	Open-road density (greater than 1 mile per square mile)	50%	46%	49%	50%
	Total road density (greater than 2 miles per square mile)	74%	71%	71%	72%
DNRC lands within Lazy Creek Subunit	Open road density (greater than 1 mile per square mile)	76%	69%	72%	73%
	Total road density (greater than 2 miles per square mile)	76%	73%	73%	74%

TABLE F-2 - EXISTING AND FUTURE GRIZZLY BEAR HIDING COVER ON DNRC OWNERSHIP WITHIN THE LAZY CREEK BEAR MANAGEMENT SUBUNIT

PROPOSAL/SALE/CONDITION	HIDING COVER IN ACRES (DNRC LAND)		STATUS
Existing condition	13,393		Existing
Chicken/Werner Timber Sale	-1,261		Sold
Taylor South Timber Sale	-632 (B)	-638 (C)	EIS, Proposal Development
Good/Long/Boyle Timber Sale	-597		EA, Alternative Selection Phase
Future condition	10,903 (B)	10,897 (C)	N/A

Mitigation measures and their effects

The application of the following mitigation measures and maintenance of the existing road density and security core levels may reduce disturbance and enhance the ability of grizzly bears to use the project area.

Alternative B would use a combination of topography, group retention, and roadside vegetation buffers to limit views into harvest units. Groups of trees would be retained within units following harvesting and site preparation to help provide for hiding cover. This treatment would reduce sight distance from open roads.

Alternative C would retain a 50-foot vegetative buffer along all open roads, although minor amounts of harvesting would occur in these buffers. Views would be limited into harvest units, although not completely eliminated. Over time, the shrubs would tend to increase in size and add to security cover.

Both alternatives plan some harvesting within the roadside vegetation buffers, but some shrubs, saplings, and larger-

diameter trees would be retained. As evidenced by buffers retained in 1995, the existing shrubs would likely grow in width and height and limit views into the harvest units on the uphillside of the roads. The vegetative buffers may not be as effective below roads due to the lack of past disturbance, which initiates shrub regeneration.

Temporary barricades would be installed on Lower Jellison Road near the south end of proposed Unit 7 while harvesting takes place within portions of Unit 3, 5, 6, and 7. This would reduce through traffic and reduce the amount of open road during harvesting activities.

Limiting proposed harvesting activities along restricted roads to the period of July 1 to March 15, the end of the denning period, would, potentially, reduce disturbance to grizzly bears during the period in the spring when bears would be more likely to use the proposed project area. Late summer or fall harvesting would reduce direct disturbance to grizzly bears within areas that have moderate spring or low summer and fall habitat values.

Indirect Effects to Grizzly Bears

- ***Indirect Effects of No-Action Alternative A***

  Foraging opportunities may decline due to the lack of diversity in habitat, such as forest edge and younger age-class stands.

- ***Indirect Effects of Action Alternatives B and C***

  Season of Activity

  No indirect effects to season of activity were identified.

  Open and Total Road Densities

  No long-term increase in either the proportion of the Lazy Creek Grizzly Bear Subunit that exceeds 1 mile per square mile of open, or 2 miles per square mile of total road densities, would occur as a result of the proposed project. No road construction or permanent changes to the status of the existing roads would occur; road-density levels would return to present levels upon completion of the proposed project (those occurring prior to all proposed or active projects in the Lazy Creek Grizzly Bear Management Subunit).

  Security Core

  No indirect effects to security core were identified.

  Hiding Cover

  No indirect effects to hiding cover were identified.

Cumulative Effects to Grizzly Bears

Increased use of road systems during all proposed and active projects, including those on private industrial lands, may temporarily increase human disturbance to grizzly bears within the Lazy Creek Grizzly Bear Management Subunit. Long-term open- and total-road densities within the Lazy Creek Bear Management Subunit would not increase due to the proposed Taylor South or Good/Long/Boyle timber sale project proposals or the active Chicken/Werner Timber Sale Project *(TABLE F-1—PERCENT OF SUBUNIT AREA BY OPEN- AND TOTAL-ROAD DENSITY STATUS THROUGH PROJECTS PROPOSED FOR THE IMMEDIATE FUTURE)*. FNF ownership contains 12 percent of the subunit on the Whitefish Divide, which is at high elevation and not entirely

forested; therefore, the naturally occurring hiding cover has received minimal human-caused disturbances on this acreage. This situation would probably continue. In conjunction with hiding cover reductions due to 1 DNRC timber sale under contract and 1 other proposed DNRC timber sale, 81.4 percent of State ownership would be retained as grizzly bear hiding cover *(see TABLE F-2—EXISTING AND FUTURE GRIZZLY BEAR HIDING COVER ON DNRC OWNERSHIP WITHIN THE LAZY CREEK BEAR MANAGEMENT SUBUNIT)*. Hiding cover for the portions of the Lazy Creek Grizzly Bear Subunit owned by the State and Plum Creek Timber Company (85 percent of the subunit) would range from 49 to 58 percent. The loss of hiding cover on State ownership and the probable further loss of hiding cover on private ownerships in adjacent areas will reduce grizzly bear security.

➢ **Wolf *(Canus lupus)***

Wolves are listed as endangered species under the Endangered Species Act. Wolves and wolf sign have been sighted within the project area, on adjacent portions of Stillwater State Forest, and on Plum Creek Timber Company land to the west of the project area. Currently, the project area is within the home range of the Whitefish pack. The project area and adjacent areas are used for hunting, breeding, and other life requirements; breeding occurred during spring 2000 on non-State ownership near the proposed project area *(T. Meier, USFWS, personal communication, August 2000)*.

Direct Effects to Wolves

- ***Direct Effects of No-Action Alternative A***

  No effects to wolves would be expected if No-Action Alternative A were selected. Wolves using the project area for any type of life requirement would be under the lowest risk of mortality or disturbance caused by wolf-human interactions under this alternative.

- ***Direct Effects Common to Action Alternatives B and C***

  Wolves may be sensitive to human disturbance at den and rendezvous sites, but they are otherwise capable of continuing to use the Swift Creek drainage under land management similar to that proposed under either alternative. Wolves would continue to use the project area similarly under either action alternative.

Mitigation measures and their effects

The application of the following mitigations may enhance the ability of wolves to use the project area.

The principal measure proposed to mitigate adverse effects of mechanized disturbance to wolves is a temporary cessation of all activity within a 1-mile radius of any known active wolf den or a 0.5-mile radius of any known rendezvous site. The Timber Sale Contract would contain this mitigation language should either action alternative be selected.

Action Alternative B would use a combination of topography, group retention, and roadside vegetation buffers to limit views into the harvest units. Following harvesting and site preparation, groups of trees would be retained within units to help provide security cover. This treatment would reduce sight distance from the open roads, providing security cover, which may lower human-caused mortality.

Action Alternative C would retain a 50-foot vegetative buffer along all open roads, although low amounts of harvesting would occur in these buffers. Views would be limited into harvest units, although not completely eliminated. Overtime, the shrubs would tend to increase in size and add security cover.

Both alternatives plan some harvesting within the roadside vegetation buffers, but they would contain shrubs, saplings, and larger-diameter trees. As evidenced by buffers retained in 1995, the existing shrubs would likely grow in width and height and limit views into the harvest units on the uphill side of roads. The vegetative buffers may not be as effective below roads due to the lack of past disturbances that initiated shrub regeneration.

Indirect Effects to Wolves

- ***Indirect Effects of No-Action Alternative A***

  No indirect effects to wolves were identified.

- ***Indirect Effects Common to Action Alternatives B and C***

  There would be no increase in open-road density and, therefore, effects to wolves and their primary prey, the white-tailed deer, should be low or negligible. White-tailed deer winter range would be largely intact and no substantive change in white-tailed deer population, distribution, or habitat use is anticipated under either alternative.

Cumulative Effects to Wolves

Timber harvesting activity has, and will continue to, reduce vegetative cover, and, therefore, reduce security from human-caused mortality. However, no substantive change in wolf use of Stillwater State Forest is expected. Wolf reproduction has occurred during the spring of 2000 on the more intensively managed, adjacent private lands. Roads in the general vicinity of the breeding area are closed and access is limited, lessening human-wolf interactions. Wolves would be expected to use the Swift Creek area in the long-term.

➢ Lynx *(Lynx canadensis)*

Lynx and lynx tracks have been observed within the proposed project area and in adjacent areas on Stillwater State Forest ***(TABLE F-3—LYNX OBSERVATIONS ON STILLWATER STATE FOREST)***. Lynx were listed under the Endangered Species Act as a threatened species on March 24, 2000 *(Federal Register, Volume 65, Number 58)*.

Studies conducted in northwest Montana indicate lynx are associated with forest stands of Engelmann spruce/subalpine fir and lodgepole pine occurring from 4,000 to 6,900 feet in elevation. Douglas-fir and western larch stands, to some extent, are also used within the lower portion of this elevation range *(Aubry et al. 2000, Koehler et al. 1979)*. Denning habitat is generally considered to include mature stands with downed logs and root wads available for den structure *(Koehler 1990, Koehler and Brittel 1990)*.

Lynx are associated with areas of relatively high snow accumulation and prey abundance; the primary prey item is the snowshoe hare *(Aubry et al. 2000, Buskirk et al. 2000)*. The weather station reporting site for Olney, Montana (approximately 5 miles west of the

project area) sets at an elevation of, approximately, 3,200 feet; average snow depths are in excess of 24 inches most years *(Lynx Habitat Mapping and Analysis Units, Flathead National Forest 2000)*. Although recent unpublished studies have found that snowshoe hares use mature stands, snowshoe hares are also relatively abundant in young dense stands where they feed on the inner bark of young trees and shrubs *(Buskirk et al. 2000, Hodges 2000)*.

The stand types and ages, elevation, and snow accumulations indicate the northern portion of the project area contains appropriate lynx denning habitat, while the southern portion from 3,500 to 4,000 feet is probably marginal, as shown in *TABLE F-4 - POSSIBLE LYNX HABITAT WITHIN THE PROPOSED PROJECT AREA BY STAND TYPE AND ELEVATION*. Snowshoe hares occur throughout the project area, although more typical lynx foraging habitat (young dense stands) occurs, primarily, on private ownership to the west of the proposed project area.

Direct Effects to Lynx

- ***Direct Effects of No-Action Alternative A***

  No effects to lynx would be expected. Lynx using the project area for any type of life requirement would be under low risk of mortality or disturbance caused by lynx-human interactions under this alternative.

TABLE F-3 - LYNX OBSERVATIONS ON STILLWATER STATE FOREST

LYNX OBSERVATION LOCATION Section/Township/ Range	OBSERVATION DATE	OBSERVATION ELEVATION	OBSERVATION TYPE	AGENCY OF OBSERVERS
34/35/24	4/2000	5,100 feet	track	DFWP
28/34/23	2/1998	4,400 feet	track	DFWP
19/34/23	2/1998	4,900 feet	track	DFWP
15/33/24	1994	3,200 feet	animal	DNRC
18/32/22*	1993	3,500 feet	track	DNRC
6/32/22*	1992	4,000 feet	animal	DNRC
*Indicates observation within proposed project area.				

TABLE F-4 - POSSIBLE LYNX HABITAT WITHIN THE PROPOSED PROJECT AREA BY STAND TYPE AND ELEVATION

STAND TYPE	ACRES IN THE 3,500 TO 4,000-FOOT ELEVATION	ACRES ABOVE 4,000 FEET ELEVATION
Douglas-fir	158.57	0
Douglas-fir/western larch	497.27	488.38
Lodgepole pine	0	19.35
Mixed conifer	13.12	23.80
Subalpine fir	0	22.02
Grand fir	470.37	298.01
Engelmann spruce	0	10.68
Totals	1,139.33	862.24

- ***Direct Effects Common to Action Alternatives B and C***

  Most of the harvesting activity, approximately 516 acres, is within the northern portion of the project area in Sections 6, 7, 18, and 19, which coincides with the stands that contain marginal lynx habitat. This includes 205 of the 785 acres of mature to old stands representing possible denning habitat that contain coarse woody debris at 4,000 feet or above. Riparian areas within these stands may serve as denning habitat and travel corridors. Large coarse woody debris is more prevalent within the riparian areas in these stands, possibly due to lower fire intensity within riparian areas. Lynx may have adapted to move between isolated foraging and denning areas through forest corridors, or riparian areas, in the southern extent of their range *(Koehler and Brittell 1990)*.

  The reduction in vegetative cover would reduce lynx security and increase the potential for direct human-caused mortality of lynx.

  Mitigations and their effects

  The application of the following mitigations would significantly enhance the ability of lynx to use the project area.

  The vegetative buffer-retention areas within 165 feet of perennial streams would retain a certain amount of large coarse woody debris within these stands. The riparian buffers would also provide travel corridors between possible denning and foraging habitat.

  Action Alternative B would use a combination of topography, group retention, and roadside vegetation buffers to limit views into harvest units. Groups of trees would be retained within units following harvesting activities and site preparation to help provide for security cover. This treatment would reduce sight distance from the open roads. To the extent the group retention of Action Alternative B would provide reduced sight distance near open and closed roads and areas of low cover, lynx and snowshoe hare security would be retained under Alternative B.

  Action Alternative C would retain a 50-foot vegetative buffer along all open roads, although low amounts of harvesting would occur in these buffers. Views would be limited into harvest units, although not completely eliminated. Overtime, the shrubs, when leafed out, would tend to increase in size and add security cover for lynx and low cover for snowshoe hares.

  Both action alternatives plan some harvesting within the roadside vegetation buffers, but they would retain shrubs, saplings, and larger-diameter trees. As evidenced by buffers retained in 1995, the existing shrubs would likely grow in width and height and limit views into the harvest units on the uphill side of the roads. The vegetative buffers may not be as effective below roads due to the lack of past disturbances, which initiate shrub regeneration.

Indirect Effects to Lynx

- ***Indirect Effects of No-Action Alternative A***

  Foraging opportunities for the primary prey of the lynx (snowshoe hare) may decline due to the lack of diversity in habitat such as forest edge and

younger age class stands.

- ***Indirect Effects Common to Action Alternatives B and C***

  The security and browse for the primary prey of the lynx (snowshoe hare) would be temporarily suppressed until young trees and shrubs regenerate to provide cover and forage.

Cumulative Effects to Lynx

The analysis area for lynx habitat is considered to be the Lazy Creek Bear Management Subunit. The Good/ Long/Boyle Timber Sale Project does not decrease denning habitat. The Chicken/Werner Timber Sale Project affects 105 acres of potential denning habitat. The lynx habitat along the Whitefish Divide is Federally owned, relatively high in elevation, and undisturbed. Although this area is more sparsely covered by conifers than the lower elevations of the proposed project area, it contains suitable lynx denning habitat.

SENSITIVE SPECIES

Sensitive Species Not Assessed:

The following sensitive species were not assessed in the project analysis because they do not inhabit the Taylor-South project area:

- Columbian sharp-tailed grouse *(Tympanuchus phasianellus columbianus)*
- Ferruginous hawk *(Buteo regalis)*
- Flammulated owl *(Otus flammeolus)*
- Mountain Plover *(Charadrius montanus)*

The following sensitive species were not assessed in the project analysis because suitable habitat does not exist in the project area or proposed activities would not affect their required habitat components:

- **Black-Backed Woodpecker**

  The project area lacks appropriate habitat components used by black-backed woodpeckers, including areas disturbed by wildfire or insect outbreaks.

- Coeur d' Alene Salamander *(Plethodon idahoensis)*

  The Coeur d' Alene salamander occurs in northwestern Montana riparian areas and its preferred habitat includes moss-covered, waterfall splash zones of rock slab or talus. If Coeur d' Alene salamanders occur within the project area, their required habitat components are well within SMZs and fisher buffer zones.

- **Common loon *(Gavia immer)***

  Common loons breed on Boyle and Beaver Lakes, which are near the project area. No lakes associated with loon breeding are within the project area.

- **Northern bog lemming *(Synaptomys borealis)***

  Northern bog lemmings generally occur in bog/fen systems that contain mat-forming moss species of the genus *Sphagnum*. Northern bog lemmings can also occur in wet meadows, mature western hemlock, and subalpine fir, and alpine habitats although Sphagnum mats are a "good, though not definitive, indicator" of this species *(Pearson 1999)*. Bog/fen systems with mats comprised of the moss genus *Sphagnum* do not occur within, or in the vicinity of, the project area.

Sensitive Species Assessed:

- **Boreal owl *(Aegolius funereus)***

  In the northern Rocky Mountains, boreal owls typically inhabit Engelmann spruce/subalpine-fir

forest stands above 4,500 feet in elevation as year-round residents *(Hayward and Verner 1994)*. Boreal owls are secondary cavity nesters generally using cavities excavated by pileated woodpeckers *(Dryocopus pileatus)* or northern flickers *(Colaptes auratus) (Hayward and Verner 1994)*.

In 1992, a boreal owl was observed between 4,400 to 4,800 feet in elevation in Section 6 of the project area (T32N, R22W). The observation occurred on State ownership during USFS survey efforts; additional observations of boreal owls were made at higher elevations along the Whitefish Divide on Federal ownership *(Tally Lake Ranger District 1999)*.

Currently, 68.3 acres of a mature and old subalpine fir cover type above 4,000 feet elevation are within the project area, representing preferred boreal owl habitat. Currently, 40 acres of a mixed-conifer cover type of mature and old trees are above 4,000 feet elevation within the project area, representing marginal boreal owl habitat.

Direct Effects to Boreal Owls

- ***Direct Effects of No-Action Alternative A***

  No effects to boreal owls would be expected should No-Action Alternative A be selected. Habitat conducive to boreal owl nesting would increase due to increased tree growth and canopy closure.

- ***Direct Effects Common to Action Alternatives B and C***

  The stands of the mature and old subalpine fir cover type above 4,000 feet elevation representing preferred boreal owl habitat within the proposed project area are not within a proposed harvest unit. The location of a 1992 boreal owl observation is within the proposed project area, but is not included in the proposed harvest units.

  Boreal owls could possibly use lower elevation areas other than Engelmann spruce/subalpine fir cover types at northern latitudes. The mature (more than 100 years old) mixed-conifer stands above 4,000 feet in elevation within the project area, representing marginal boreal owl habitat, are also not within the proposed harvest units. In Section 6 and 7 of the project area, 399 acres may be marginal boreal owl foraging habitat. To the extent boreal owls use lower elevation marginal habitat, Action Alternative B, which allows for group retention of mature trees (including snags), may promote faster recovery of habitat conditions favorable to boreal owls.

  In the southeast quarter of Section 7, Action Alternatives B and C would both retain an area of 1 to 3 acres that contain abundant western larch snags. This area, combined with the retention of some dominant trees and all snags that are safe to retain within the harvest units, may allow for some boreal owl use or more rapid recolonization of the area.

Indirect Effects to Boreal Owls

- ***Indirect Effects of No-Action Alternative A***

  No indirect effects to boreal owls were identified.

- ***Indirect Effect of Action Alternatives B and C***

  No indirect effects to boreal owls were identified.

Cumulative Effects to Boreal Owls

The Good/Long/Boyle Timber Sale Project affects no boreal owl habitat. The Chicken/Werner Timber Sale Project affects 57 acres of potential boreal owl habitat. The habitat along Whitefish Divide is Federally owned, relatively high in elevation, and undisturbed. Although this area is more sparsely covered by conifers than the lower elevation of the proposed project area, it contains suitable boreal owl habitat.

➢ **Harlequin duck *(Histrionicus histrionicus)***

Harlequin ducks migrate in late spring from coastal waters to breed in relatively large, swift mountainous streams in coastal and interior mountain ranges. Nesting occurs on clear streams with cobble and boulder substrate and vegetative cover; typically, downed logs or logjams are present *(Cassirer et al. 1996)*. The breeding range diet consists of benthic invertebrates found in clear streams with a cobble substrate, and in-stream boulders and woody debris are used during loafing periods *(Cassirer et al. 1996)*. Nests are generally in the immediate riparian zone in dense vegetation, woody debris, rocks, or undercut banks; nests have been recorded in hollow trees in the upland forest and have been found up to 55 meters from the stream *(Cassirer et al. 1996, Bruner 1999)*. This may occur in an attempt to avoid high spring flows and predators. Harlequin ducks have been surveyed for, and sighted in, Swift Creek, which lies within Sections 18, 19, 30, and 31, T32N, R23W, of the project area. Although no broods (groups of ducklings) have been recorded on Swift Creek, female harlequin ducks have been observed in 1990, 1991, 1994, and 1995 (M. Beer, 2000. Montana Natural Heritage Program [MNHP], personal communication, MNHP 2000). This suggests breeding may occur within the project area.

Direct Effects to Harlequin Ducks

- ***Direct Effects of No-Action Alternative A***

  No additional effects to harlequin ducks would be expected.

- ***Direct Effects of Action Alternatives B and C***

  Due to mitigation, no additional direct effects to harlequin ducks would be expected.

Mitigation measures

Generally, harlequin ducks nest in the riparian area adjacent to streams and have not been found to nest further than 55 meters, or 180 feet, from a stream *(Bruner 1999, Cassirer et al. 1996)*. A minimum 165-foot buffer on Swift Creek would allow for the protection of typical harlequin duck nesting habitat. The 165-foot fisher buffers and/or 50-foot SMZs would also help protect water quality on the tributaries of Swift Creek. The application of these mitigations would maintain the ability of harlequin ducks to use the project area.

Indirect Effects to Harlequin Ducks

No indirect effects to harlequin ducks were identified.

Cumulative Effects to Harlequin Ducks

Water quality, structural diversity of riparian vegetation, and human disturbance are the primary factors that could cumulatively affect the ability of harlequin ducks to inhabit the

Swift Creek drainage. Harlequin duck habitat would not be affected by proposed or future State timber harvest sales due to mitigations and regulations designed to protect wildlife habitat and water quality on State property. Private property has been subject to SMZ regulations since 1991. Aerial photos show relatively intact riparian shrub and conifer vegetation on private and State property along Swift Creek. SMZs, fisheries concerns, fisher buffers, and water quality regulations have combined to maintain relatively high water quality and historic riparian vegetation conditions within the Swift Creek drainage, although natural slumps occur in several areas along Swift Creek.

➢ **Fisher *(Martes pennanti)***

The fisher is a medium-sized forest carnivore and a member of the mammalian family Mustelidae, generally referred to as the weasel family, which includes skunks, weasels, and other moderately sized carnivores. Fisher prey includes small mammals such as the red-backed vole (Clethrionomys gapperi), red tree squirrels (Sciurus hudsonicus), chipmunks (Tamiasciurus spp), northern flying squirrels (Glaucomys sabrinus), as well as snow-shoe hares (Lepus americanus), porcupines (Erethizon dorsatum), birds, and carrion *(Powell and Zielinski 1994)*. In northern Idaho and northwestern Montana, female fishers inhabit home ranges of approximately 15 to 30 square kilometers, and males have home ranges of approximately 80 square kilometers *(Jones 1991, Heinemeyer 1993)*. In the western United States, fisher prefer mature (greater than 100 years old), closed-canopied forest stands for denning and resting habitat *(Jones and Garton 1994, Powell and Zielinski 1994)*. Cover types considered appropriate for fisher habitat include Douglas-fir, western larch, Engelmann spruce, grand fir, and mixed conifer.

According to DNRC SLI data, 3,091 acres of mature stands of appropriate cover type with greater than 70 percent canopy closure are within the project area. Of these stands, 1,127 acres are 100 to 149 years old and 1,964 acres are greater than 150 years old. There are 785 acres of mature conifer stands with 40 to 70 percent canopy closure. Of these stands, 608 acres are 100 to 149 years old and 177 acres are greater than 150 years old. Mature stands of the Douglas-fir, western larch, Engelmann spruce, grand fir, or mixed-conifer stand types were considered to be preferred fisher habitat. Twenty-two acres of subalpine fir stand type were not considered to be preferred fisher habitat due to elevation.

Jones (1991) found that in north central Idaho, fishers used stands adjacent to riparian areas in greater proportion to their availability. In northern Idaho and northwestern Montana, resting sites and movement corridors used by fisher were closed-canopied riparian areas, and open areas were avoided *(Jones 1991, Roy 1991, Heinemeyer 1993)*. With this information, the SFLMP guidance applies riparian buffers (165 feet on each side of a perennial stream, 83 feet on each side of intermittent streams) to be retained in appropriate forest types *(DNRC 1996)*. Harvesting activity should retain 75 percent of the riparian buffer acreage of appropriate forest type in well-stocked (greater than 70 percent canopy closure) stands, with at least a moderately stocked

(greater than 40 percent canopy closure) mature tree component, at the grizzly bear management subunit level. Mature stands that are at least moderately stocked with mature trees comprise 79.3 percent of the fisher riparian buffers of appropriate stand types within the Lazy Creek Bear Management **Subunit *(TABLE F-5—LAZY CREEK BEAR MANAGEMENT SUBUNIT RIPARIAN FISHER BUFFER ACREAGE BY FOREST TYPE AND CANOPY CLOSURE [COVER TYPES NOT PREFERRED BY FISHER, NONFORESTED OR HIGH ELEVATION AREAS ARE EXCLUDED]).*** An additional 227.18 acres within the bear management subunit are of inappropriate stand type (such as nonforested areas or subalpine fir type). Field reviews of the fisher buffers within the project area concur with SLI. For instance, a majority of the fisher riparian buffers appeared to have coniferous canopy closures of 60 to 70 percent.

Recent sightings of fishers have occurred in Hell Roaring Basin, 2 to 3 miles east of the project area on Federal land (2 winter sightings, 1 summer sighting), and near Upper Whitefish Lake, 8 to 9 miles northwest of the project area on State land (1 highly probable summer sighting).

Direct Effects to Fishers

- ***Direct Effects of No-Action Alternative A***

  No effects to fishers would be expected. Under this alternative, fishers using the project area for any type of life requirement would be under the lowest risk of mortality or disturbance caused by fisher-human interactions. Habitat conducive to fisher resting and travel use may increase due to increased tree growth and canopy closure.

- ***Direct Effects Common to Action Alternatives B and C***

  Due to elevation, 22 acres of the subalpine fir stand type within the proposed project area were not considered to be fisher habitat. Action Alternatives B and C reduce fisher habitat by 597 and 601 acres, respectively, or approximately 15 percent of the proposed project area under both alternatives ***(TABLE F-6—****ACRES OF MATURE STANDS RETAINED BY AGE CLASS AND CANOPY CLOSURE LEVEL UNDER EACH ALTERNATIVE [ACRES HARVESTED])*. To the extent that Alternative B allows for group retention of mature trees, habitat with mature structure and forest edge that

TABLE F-5 - LAZY CREEK BEAR MANAGEMENT SUBUNIT RIPARIAN FISHER BUFFER ACREAGE BY FOREST TYPE AND CANOPY CLOSURE (COVER TYPES NOT PREFERRED BY FISHER, NONFORESTED OR HIGH ELEVATION AREAS ARE EXCLUDED).

FOREST TYPE	ACREAGE BY PERCENT OF CANOPY CLOSURE LEVELS OF MATURE TREES ONLY (MORE THAN 9" DIAMETER AT 4.5' ABOVE THE GROUND)			
	0-39%	40-69%	>70%	Total
Cedar	8.80	0	0	8.80
Douglas-fir	19.00	5.25	40.15	64.40
Western larch	52.20	73.82	78.30	204.32
Spruce	17.76	105.48	0	123.24
Douglas-fir/western Larch	68.88	91.27	208.65	368.80
Grand fir	18.22	122.93	142.70	283.86
Lodgepole pine	23.32	0	0	23.32
Mixed conifer	41.70	62.40	4.02	108.11
Western white pine	0	0	2.78	2.78
Total	249.88	461.15	476.60	1,187.63

TABLE F-5 - ACRES OF MATURE STANDS RETAINED BY AGE CLASS AND CANOPY CLOSURE LEVEL UNDER EACH ALTERNATIVE (ACRES HARVESTED)

STAND AGE	100-149 YEARS OLD		> 150 YEARS OLD	
Canopy closure	40-70%	>70%	40-70%	>70%
Existing acres (Alternative A)	608	1127	177	1964
Alternative B	606 (-2)	873 (-254)	0	1623 (-341)
Alternative C	606 (-2)	869 (-258)	0	1623 (-341)

is used by fisher for foraging may recover in a shorter time period under this alternative.

Under both alternatives, between 1 and 3 acres of the riparian fisher buffers would be harvested along Vars Creek. This reduces the mature, closed-canopy conditions within riparian buffer corridors from 79.3 percent to 78.8 percent of the buffer acreage within the Lazy Creek Bear Management Subunit. A standard 50-foot SMZ would be retained in these areas.

Both action alternatives retain approximately 1,620 acres of old and 870 acres of mature well-stocked stands within the project area *(TABLE F-6—LAZY CREEK BEAR MANAGEMENT SUBUNIT RIPARIAN FISHER BUFFER ACREAGE BY FOREST TYPE AND CANOPY CLOSURE [COVER TYPES NOT PREFERRED BY FISHER, NONFORESTED OR HIGH ELEVATION AREAS ARE EXCLUDED])* in relatively large, contiguous blocks. These blocks are connected to one another or to adjacent Federal land *(FIGURE F-1—MATURE STANDS IN TAYLOR SOUTH PROJECT AREA)* either directly or by riparian corridors. The general concentration of the harvesting activity to one 700-acre area, which also includes the retention of tree groupings and riparian corridors, could represent the emulation of the predominate natural disturbance, the mixed-severity wildfire. The age, composition, and juxtaposition of forest stands within the project area is within the range of variability the fisher has adapted to, and continued use of the project area by this species should persist.

Mitigations and their effects

The application of the following mitigations would significantly enhance the ability of fisher to use the project area.

The fisher buffer-retention areas within 165 feet of perennial streams would retain a certain amount of large coarse woody debris and mature canopy cover. The riparian fisher buffers would provide travel, resting, and foraging habitat.

Indirect Effects to Fishers

- ***Indirect Effects to No-Action Alternative A***

  Foraging opportunities for fishers may decline due to the lack of diversity in habitat such as edge and younger age class stands.

- ***Indirect Effects Common to Action Alternatives B and C***

  No indirect effects to fisher were identified.

Cumulative Effects to Fishers

FIGURE F-1

N
MATURE STANDS IN TAYLOR SOUTH PROJECT AREA
LEGEND
Stand Classification
Old Growth
100-Old Growth
Proposed Units
Streamcourse
Existing Roads
USFS
USFS
USFS
USFS
PVT
PVT
Taylor Creek Road
Lower Hillcrest Rd
04
05
06
08
09
16
21
28
30
31
32
33

The timber harvesting associated with either Action Alternative B or C would reduce tree density, and, therefore, future amounts of large live trees and accumulations of coarse woody debris, as well as other mature-forest attributes that are important to fishers. Security cover for movement, foraging, and general predator avoidance is relatively intact within the Lazy Creek Bear Management Subunit (fisher analysis area). Mature, closed canopy conditions within riparian buffer corridors would be 78.8 percent of the buffer acreage within the Lazy Creek Bear Management Subunit. A certain amount of the buffer acreage is a riparian shrub component that is naturally lacking of conifer species.

➢ **Pilaeated Woodpecker *(Dryocopus pileatus)*:**

Mature stands of Douglas-fir, western larch, Engelmann spruce, grand fir, or mixed conifer stand types are considered to be preferred pileated woodpecker habitat. In western Montana, the pileated woodpecker roost and nest trees generally occur in mature stands with an average canopy closure greater than 40 percent (McClelland and McClelland 1999). Pileated woodpeckers excavate nesting and roosting cavities primarily in live and dead western larch, ponderosa pine, and black cottonwood trees that are generally greater than 20 inches in diameter at 4.5 feet above the ground (Bull 1987, McClelland and McClelland 1999).

Removal of large western larch by past timber-harvesting activity has reduced habitat quality for pileated woodpeckers. Large live and dead trees are less common than would occur naturally due to past timber-harvesting activity. Black cottonwoods occur within SMZs along Swift Creek and its tributaries.

Douglas-fir and grand fir occur in the proposed project area and are primarily used for foraging on invertebrates, a high percentage of which are carpenter ants *(Bull et al. 1992)*.

According to DNRC SLI data, there are 3,876 acres of mature conifer stands with greater than 40 percent canopy closure within the proposed project area. Of these stands, 1,735 acres are 100 to 149 years old, and 2,141 acres are older than 150 years. An additional 40 acres are mature Engelmann spruce, western larch, and Douglas-fir with less than 40 percent canopy closure. Although feeding activity may occur in these stands, this represents poor pileated woodpecker habitat due to low canopy closure.

Twenty-two acres of the subalpine fir stand type within the proposed project area was not considered to be preferred pileated woodpecker habitat.

Direct Effects to Pileated Woodpeckers

- ***Direct Effects of No-Action Alternative A***

  No direct effects to pileated woodpeckers would be expected.

- ***Direct Effects Common to Action Alternatives B and C***

  Action Alternatives B and C reduce preferred pileated woodpecker habitat by 597 and 601 acres, respectively, or approximately 15 percent under each alternative *(TABLE F-7– ACRES OF MATURE STAND RETAINED [AND ACRES HARVESTED] BY AGE*

TABLE F-7 - ACRES OF MATURE STANDS RETAINED (AND ACRES HARVESTED) BY AGE CLASS AND CANOPY CLOSURE LEVEL UNDER EACH ALTERNATIVE.

STAND AGE	100-149 YEARS OLD			> 150 YEARS OLD		
Canopy closure	0-40%	40-70%	>70%	0-40%	40-70%	>70%
Existing acres (Alternative A)	39	608	1,127	0	177	1,964
Alternative B	34 (-5)	606 (-2)	873 (-254)	0	0	1,623 (-341)
Alternative C	34 (-5)	606 (-2)	869 (-258)	0	0	1,623 (-341)

CLASS AND CANOPY-CLOSURE LEVEL UNDER EACH ALTERNATIVE). Both alternatives would reduce current pileated woodpecker use of the proposed project area, particularly within and adjacent to harvest units.

Both action alternatives retain approximately 1,620 acres of old and 870 acres of mature well-stocked stands within the project area in relatively large, contiguous blocks. These blocks are connected to one another or to adjacent Federal land *(FIGURE F-1—MATURE STANDS IN TAYLOR SOUTH PROJECT AREA)* either directly or by riparian corridors. The general concentration of the harvesting activity to one 700-acre area, which also includes the retention of tree groupings and riparian corridors, could represent the emulation of the predominate natural disturbance, the mixed-severity wildfire. The age, composition, and juxtaposition of forest stands within the project area is within the range of variability the pileated woodpecker has adapted to, and continued use of the project area by this species should persist.

Mitigations and their effects

Black cottonwood, generally occurring within with SMZs, would not be harvested. Snag retention and snag recruitment guidance *(DNRC 5/97)* would be met by both action alternatives. To the extent these mitigations are applied, Alternative B, which allows for group retention of mature trees (including some areas with existing snags), may allow for recovery of habitat conditions favorable to pileated woodpeckers in a shorter time period. In the southeast quarter of Section 7, Alternatives B and C would both retain an area of 1 to 3 acres in size containing live trees and abundant western larch snags. This area, combined with the retention of some dominant trees and all snags safe to retain within the harvest units, may allow for some pileated woodpecker use of the proposed harvest units and shorter recovery to preferred pileated woodpecker habitat.

Indirect Effects to Pileated Woodpeckers

- ***Indirect Effects of No-Action Alternative A***

  Habitat conditions favorable to pileated woodpeckers may increase on the proposed project area due to increased tree growth, decadence, and canopy closure.

- ***Indirect Effects of Action Alternatives B***

and C

No indirect effects to pileated woodpeckers were identified.

Cumulative effects to pileated woodpeckers

Timber harvesting associated with either action alternative would represent cumulative reductions in pileated woodpecker habitat when considered in conjunction with past and ongoing timber harvesting activities on State and adjacent ownerships. Action Alternatives B and C both propose to reduce tree density, therefore, decreasing existing canopy closure levels and future accumulations of large live trees, large snags, and large downed logs. These mature-forest attributes are important to pileated woodpeckers for foraging, roosting, nesting, and predator avoidance. Within the project area and on State land within 1 mile south of the proposed project area, approximately 3,400 acres of mature to old stands representing preferred pileated woodpecker habitat would be retained. The Chicken/Werner Timber Sale Project area, which encompasses 7 square miles directly north, retains approximately 1,572 acres, or 81 percent, of the available mature and old stands preferred by pileated woodpeckers. Preferred pileated woodpecker habitat on the adjacent Plum Creek Timber Company lands, which may be more suited due to lower elevation, may continue to decline. Pileated woodpeckers may still inhabit the general vicinity of the proposed project area, but at reduced levels in the vicinity of harvested areas until stands mature.

BIG GAME

White-tailed deer (Odecoilius virginianus)

Thermal cover and winter range

Several studies have been conducted concerning white-tailed deer habitat relationships in northwestern Montana. *Krahmer (1989)* found winter habitat use occurred in stands with an average of 70 percent canopy closure, generally in valley bottoms or on gentle slopes with a southern or western exposure.

Approximately 77 percent of the acres within State-owned sections included in the proposed project area are comprised of appropriate winter white-tailed deer thermal cover, which is defined as greater than 70 percent conifer canopy closure, not including western larch *(TABLE F-8 - WHITE-TAILED DEER THERMAL COVER BY SECTION NUMBER WITHIN THE TAYLOR SOUTH PROPOSED PROJECT AREA [INCLUDES ALL STATE LAND WITHIN T32N, R22W])*. Certain State-owned sections within the project area contain white-tailed deer winter range designated by DFWP. Approximately 74.9 percent of the acres within these State-owned sections contain appropriate winter thermal cover for white-tailed deer. Winter furbearer survey routes on Lower Whitefish Road confirm heavy deer use in the southern sections (19, 29, and 32) of the project area.

Direct Effects to White-tailed Deer

- ***Direct Effects of No-Action Alternative A***

  No effects to white-tailed deer thermal cover and winter range would be expected. White-tailed deer using the project area would be under the lowest risk of mortality or disturbance caused by deer-human interactions under this alternative.

- ***Direct Effects Common to Action Alternatives***

TABLE F-8 - WHITE-TAILED DEER THERMAL COVER BY SECTION NUMBER WITHIN THE TAYLOR SOUTH PROPOSED PROJECT AREA (INCLUDES ALL STATE LAND WITHIN T32N, R22W

SECTION NUMBER	LARCH COVER	NO THERMAL COVER	WINTER THERMAL COVER	TOTAL FORESTED ACRES IN SECTION	PERCENT WINTER THERMAL COVER
6	0	0	198.4	198.4	100.0
7	39.1	13.8	462.6	515.5	89.7
17	110.3	8.2	23.8	142.3	16.7
18	0	87.2	474.8	562.0	84.5
19*	66.1	64.7	345.4	476.1	72.5
20*	6.9	0	240.0	246.9	97.2
29*	88.7	51.6	168.1	308.5	54.5
30*	20.9	0	434.6	455.5	95.4
31*	137.9	181.9	314.2	634.0	49.6
32*	0	15.8	511.7	527.5	97.0
33*	54.5	15.8	86.1	156.3	55.0
Totals			3,259.6	4,223.0	77.2

**Sections with DFWP-designated winter range*

B and C

Acreage of winter thermal cover for white-tailed deer would be reduced from 77 to 71 percent of the project area *(TABLE F-9—PRESENT AND FUTURE WHITE-TAILED DEER THERMAL COVER ACCORDING TO STAND LEVEL INVENTORY BY SECTION WITHIN THE TAYLOR-SOUTH PROPOSED PROJECT AREA)*. Within State-owned sections containing DFWP-designated winter range, the acreage of winter thermal cover would be reduced from the existing 74.9 percent to 68.5 percent under Alternative B, and 68.6 percent under Alternative C. Alternative B would allow for small areas of winter thermal cover within retention groups.

Mitigation and its effect

Both alternatives would retain some vegetative cover within units and along roadsides, providing security from humans or animals by the reduction of sight distance.

TABLE F-9 - PRESENT AND FUTURE WHITE-TAILED DEER THERMAL COVER ACCORDING TO STAND LEVEL INVENTORY BY SECTION WITHIN THE TAYLOR-SOUTH PROPOSED PROJECT AREA

SECTION NUMBER	WINTER THERMAL COVER	TOTAL ACRES IN SECTION	PRESENT PERCENT OF THERMAL COVER	APPROXIMATE ACRES AFFECTED	FUTURE PERCENT THERMAL COVER
6	198.4	198.4	100	72	63.7
7	462.6	515.5	89.7	327	26.3
17	23.8	142.3	16.7	0	16.7
18	474.8	562.0	84.5	59	74.0
19*	345.4	476.1	72.5	60	59.9
20*	240.0	246.9	97.2	43	79.8
29*	168.1	308.5	54.5	38 (34 in Alternative C)	42.2 (43.5 in Alternative C)
30*	434.6	455.5	95.4	2 (0 in Alternative C)	95.0 (95.4 in Alternative C)
31*	314.2	634.0	49.6	0	49.6
32*	511.7	527.5	97.0	19	93.4
33*	86.1	156.3	55.0	24	39.7
Totals	3259.6	4223.0	77.2	243	71.4

**Sections with DFWP-designated winter range*

Indirect Effects to White-tailed Deer

- ***Indirect Effects of No-Action Alternative A***

  Foraging opportunities may decline due to the lack of diversity in habitat, such as forest edge and younger age class stands.

- ***Indirect Effects Common to Action Alternatives B and C***

  No indirect effects to white-tailed deer were identified

Cumulative Effects to White-tailed Deer

White-tailed deer winter range occurs outside the proposed project area to the south and west on State land *(TABLE F-10 - WHITE-TAILED DEER THERMAL COVER ON STATE-OWNED LAND BY SECTION SOUTH OF THE PROPOSED PROJECT AREA IN THE BEAVER LAKE BLOCK [T31N, R22W] and TABLE F-11— WHITE-TAILED DEER THERMAL COVER ON STATE-OWNED LAND BY SECTION SOUTH OF THE PROPOSED PROJECT AREA IN THE STILLWATER LAKE BLOCK [T32N, R23W])*, and to the west and southeast on private ownership. The largest impact to the white-tailed deer winter range on private ownership is residential development on the northeast shore of Whitefish Lake. Some timber harvesting may occur on the higher elevation midslope portions of the privately owned white-tailed deer winter range. The private ownership to the west is owned by Plum Creek Timber Company. Winter thermal cover may decline from present levels on this area due to commercial timber harvesting.

Approximately 47 percent of the acreage of the State-owned sections within the Beaver Lake area is comprised of appropriate winter white-tailed deer thermal cover (greater than 70 percent canopy closure, not including western larch). All of the State-owned sections with thermal cover contain white-tailed deer winter range designated by DFWP. After completion of the Beaver Lake Timber Sale (in progress), winter thermal cover in patches more than 40 acres in size in this area will decline by 51 acres.

Although DFWP has not designated white-tailed deer winter range within these sections, approximately 34 percent of the acreage of these State-owned sections in the area south of the proposed project area is comprised of appropriate winter white-tailed deer thermal cover

TABLE F-10 - WHITE-TAILED DEER THERMAL COVER ON STATE-OWNED LAND BY SECTION SOUTH OF THE PROPOSED PROJECT AREA IN THE BEAVER LAKE BLOCK (T31N, R22W)

SECTION	LARCH COVER (SUMMER THERMAL ONLY)	NO THERMAL COVER	WINTER THERMAL COVER	TOTAL ACRES	% WITH WINTER THERMAL COVER
6	60.3	91.2	21.1	172.6	12.2
7	137.7	9.0	143.4	290.0	49.5
8	174.6	23.8	38.5	236.9	16.2
16	25.1	145.9	454.6	625.6	72.7
17	53.8	138.1	443.5	635.4	69.8
18	373.8	109.0	148.8	631.6	23.6
19	234.6	28.5	217.1	480.1	45.2
20	206.6	75.4	221.3	503.3	44.0
21	23.4	0	14.2	37.6	37.9
28	34.7	43.8	85.9	164.3	52.2
29	83.2	76.9	82.1	242.2	33.9
Totals	1,407.8	741.5	1,870.3	4,019.6	46.5

TABLE F-11 - WHITE-TAILED DEER THERMAL COVER ON STATE-OWNED LAND BY SECTION SOUTH OF THE PROPOSED PROJECT AREA IN THE STILLWATER LAKE BLOCK (T32N, R23W)

SECTION	LARCH COVER (SUMMER THERMAL ONLY)	NO THERMAL COVER	WINTER THERMAL COVER	TOTAL ACRES	% WITH WINTER THERMAL COVER
5	0	379.8	213.3	593.1	36.0
6	101.6	184.1	288.7	574.4	50.3
7	26.2	301.3	211.9	539.5	39.3
8	40.3	122.8	326.9	489.9	66.7
17	93.9	160.6	335.4	589.8	56.9
18	28.0	292.0	168.4	488.4	34.5
19	134.8	289.8	16.2	440.8	3.7
20	0	151.7	32.7	184.4	17.7
21	291.6	240.4	0	532.0	0.0
27	0	233.1	379.4	612.5	61.9
28	304.9	83.6	170.4	558.9	30.5
29	31.1	466.8	0	497.9	0.0
30	50.9	352.5	34.9	438.3	8.0
31	0	410.3	163.5	573.8	28.5
32	188.1	294.7	72.3	555.1	13.0
33	142.6	111.8	159.7	413.0	38.7
34	46.0	123.0	18.7	187.7	10.0
35	0	40.7	366.7	407.4	90.0
Totals	1,480.0	4,238.0	2,959.0	8,677.9	34.1

(greater than 70 percent canopy closure, not including western larch). The proposed Good-Long-Boyle Timber Sale Project would reduce winter thermal cover by approximately 277 acres, lowering the winter thermal cover in the Stillwater Lake block from 34 percent to 33 percent.

APPENDIX G

ECONOMICS

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX G

ECONOMICS

INTRODUCTION

Included in this appendix is an overview of economic conditions related to the proposed timber sale, DNRC management directions, and an overall economic outlook of the timber industry.

CURRENT CONDITIONS

Based on a past study, 20 to 35 percent of the economy of Flathead County can be attributed to the wood-products industry (*The Role of the Wood Products Industry in the Economy of Flathead County, Montana, An Estimate of the Effects on Total Employment Using Input-Out Analysis, Beckley 1994)*. This estimate of the economic effect of the wood products industry was determined, primarily, with the use of the computer program *Micro Implan*, an economic-impact model based on county-level economic data (Beckley, 1994).

The current lumber market appears to be heading downward *(July 2000)* because:

- lumber production for the first quarter of 2000 is up (increasing the supply of lumber);
- further increases in interest rates for home mortgages are likely (one-half percent increase in the FED rate on May 17, 2000 and there is talk of more), and
- the recent drop in Lumber Futures price of over $75 per MBF since March.

American Timber Mill in Olney announced last January that they would close on or before July 28, 2000. Pete Larson (CEO, American Timber) cited decline in the availability of Federal timber as the reason for the closure. He was quoted in the *Missoulian (1/12/2000)*: "Our closing might help the other little mills for a while, but it won't be enough. It's like they're drowning, and our quitting is allowing them to get a breath of fresh air. But the problem is still

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there: They're still drowning, and none of them are strong enough to swim out of it."

The closure of American Timber Mill in Olney may make meeting the Legislative mandated revenue-to-cost ratio of 2:1 more difficult. The last couple of sales purchased by American Timber were at stumpage prices very close to the targeted stumpage price necessary to meet the 2:1 revenue-to-cost ratio. Based on a multivalent regression for all years (1979-2000) in the Transaction Evidence database, the loss of one bidder could show a reduced winning bid of $4.00 per ton. The loss of American Timber may result in less competition, which may result in lower bids for timber sales out of the Eureka/Kalispell/Columbia Falls market area.

CUMULATIVE EFFECTS OF ALL ALTERNATIVES ON THE FOREST PRODUCTS INDUSTRY

The last survey of Montana's forest products industry was done in 1994 *(Keegan et al 1995). TABLE G-1—THE CUMULATIVE EFFECTS OF THE WOOD SUPPLY TO THE REGIONAL FOREST PRODUCTS INDUSTRY* describes the cumulative effects of the wood supply to the regional forest products industry. The long-term impacts are difficult to assess given today's global markets. The importance of State timber sales to the regional economy is dependent upon the wood supply originating on USFS, private nonindustrial, private industrial, and tribal lands.

The following mill capacity estimates are from *Montana's Forest Products Industry "A Descriptive*

TABLE G-1 - THE CUMULATIVE EFFECTS OF THE WOOD SUPPLY TO THE REGIONAL FOREST PRODUCTS INDUSTRY

COUNTY	ANNUAL CAPACITY OF LOCAL MILLS (MMBF)1	CONTRIBUTION (BY PERCENT) TO LOCAL MILL VOLUME (ANNUAL CAPACITY)2		
		NWLO (DNRC) ANNUAL TARGET OF 24 MMBF	NO-ACTION ALTERNATIVE A	ACTION ALTERNATIVES B AND C
Lincoln	144	17%	0%	3%
Flathead	179	13%	0%	3%
Lake/ Mineral/ Sanders3	180	13%	0%	3%
All Counties	503	5%	0%	1%

1Mill Capacity was reduced by 10% to reflect recent reduction in capacity (personal communication with Chuck Keegan 1999). The Flathead county capacity was reduced by 100 to reflect the impending loss of American Timber Mill at Olney.

2Based upon the Northwest Land Office harvest history, all of the State timber sale volumes would not likely stay in 1 county. In most cases, State wood is distributed to mills throughout several counties; therefore, the contribution of sale volumes to "All Counties" is the most likely effect of NWLO sales. If 1 of the 2 action alternatives were selected, the sale volume would likely stay in Lincoln and/or Flathead County and direct effects of the sale would be on the capacity in those 2 counties.

3Additional timber sale volume from the SWLO (DNRC) was not included in this analysis for the northwest portion of the State. Had those figures been included, DNRC's timber volume contribution to Mineral County would have been higher.

Analysis" 1969-1994 (Keegan et al. 1995).

In Lincoln and Flathead counties, Action Alternative B or C of the proposed Taylor South Timber Sale Project represents approximately 1 percent of the forest products' capacity and processing for a single year. The estimates of local wood products processing were similar to mill capacity and are located in the project file at Stillwater Unit.

JOBS AND INCOME

The impacts on local communities are estimated by quantifying jobs and income associated with harvesting and processing the timber into final products. Regional response coefficients estimated for northwestern Montana indicate that timber harvesting provides 10.58 direct jobs per MMBF, and a total direct income of $337,146 *(Keegan et al.)*, for an average annual income of $31,866.35 per job.

Important to note is that the response coefficients are an accounting of what has happened historically. These response coefficients are average values and are not marginal values. To say the consequence of not selling this sale would result in the loss of XX amount of jobs and YYY amount of income may not be correct. A marginal analysis would have to be done in order to be more certain that there would be a reduction in income and employment. Lack of a marginal analysis and the use of average numbers commonly result in an overestimation of the total economic effects *(Godfrey and Beutler 1993)*.

PAST COSTS AND REVENUES FROM THE DNRC FOREST SALE PROGRAM

DNRC does not have a formal accounting system to track costs for individual projects from start to finish. An annual cash-flow analysis is conducted of the DNRC forest product sales program. Revenue and costs are calculated by land office and at the Statewide level. The revenue-to-cost ratios are a measure of economical efficiency. A ratio value less than 1.0 means the costs are higher than the revenues (losing money). A ratio greater than 1.0 means the revenues are higher than the costs (making money). A ratio equaling 1.0 means the costs equal the revenues. Ratio for the NWLO is reflected in *TABLE G-2--REVENUES/COST RATIOS*.

OTHER SOURCES OF REVENUE TO THE TRUST WITHIN THE PROJECT AREA

Currently, DNRC is generating revenue in the project area from a conservation lease ($3,010/year), a special use lease ($880/year), and 4 snowmobiling licenses ($2,200/year), which totals, approximately, $6,090 per year.

Connected with the conservation lease, the Department salvaged

TABLE G-2 - THE NET REVENUE/COST RATIOS (TIMBER SALE ACCOUNTING SUMMARY - FY95 AND REVISED FY94 MEMO, FY96, FY97, FY98)

	TOTAL REVENUE/TOTAL COST RATIIO*					
FISCAL YEAR:	**FY95**	**FY96**	**FY97**	**FY98**	**FY99**	**FY00**
Northwestern Land Office	2.41	1.51	1.52	1.58	1.23	3.18
Total State Timber Sale Program	2.07	1.68	1.89	1.72	1.36	2.78

** Total revenue is revenue from timber sales, permits, FI, and road maintenance; total cost is the sum of timber-operating and general-administration costs.*

beetle-infested timber in FY 2000 for a gross revenue of $3,000 from the lease area. The Department receives an annual rent payment to not actively manage this lease and, yet, is able to salvage dead and dying trees at a reasonable return.

Four snowmobile outfitters use this project area; the agreement for snowmobiling is for an area larger than just the project area. Lower and Upper Whitefish roads act as main access routes to State and Federal snowmobile trail systems. Also, the Flathead Snowmobile Association, which grooms trails, pays an annual license rental fee of $200.00. Currently, the project area has no special recreational licenses for outfitting other than guided snowmobile tours.

State lands are available for nonmotorized recreational use to anyone purchasing a Recreational Use License for State lands. Licenses are not site specific and allow use of all legally accessible State lands; therefore, it is very difficult to determine the amount of recreational use and income resulting from license sales for a specific area. Statewide, from March 1, 1999 through February 28, 2000 (recreational use licensing year), the total gross revenue to the trust was $290,447. There are approximately 5,157,380 acres of trust land Statewide *(Annual Report for FY 1998, surface acreage)*. Therefore, an average gross revenue of approximately $.056/acre ($290,447 , 5,157,380) was made for license year 2000. Applying the Statewide average revenue per acre to State land in the project area of, approximately, 5,000 acres produces estimated revenue of $280 (.056 X 5,000 acres) per year from General Recreational Use Licenses for this project area, assuming this area receives an average amount of paid recreational use.

PAST HARVESTS FROM THE TAYLOR SOUTH TIMBER SALE PROJECT AREA

TABLE G-3 - PAST HARVESTING BY SCHOOL GRANT AND SECTION is a review of past harvesting activity in the Taylor South Timber Sale Project area. These estimates of past harvesting activity are from the section record cards that are located in Missoula. The volume is only for products that were entered as board feet into the section record cards. MBF/Acre is past harvest volumes (MBF) divided by acres.

TABLE G-3 - PAST HARVESTING BY SCHOOL GRANT AND SECTION

TOWNSHIP	RANGE	SECTION	GRANT	ACRES	VOLUME HARVESTED	
					MBF	MBF/ACRE
32N	22W	06	S.M.	310	2,032	6.5
32N	22W	07	S.N.S.	634	5,927	9.3
32N	22W	17	S.M.	160	1,177	7.4
32N	22W	18	A.C.B.	634	5,040	8.0
32N	22W	19	A.C.B.	634	7,214	11.4
32N	22W	20	D.& D.A.	320	2,505	7.8
32N	22W	29	S.M.	320	1,887	5.9
32N	22W	30	A.C.B.	634	5,679	9.0
32N	22W	31	A.C.B.	634	7,421	11.7
32N	22W	32	A.C.B.& A.C.I.	600	4,231	7.1
32N	22W	33	D.& D.A.	160	519	3.2
All Sections and Grants				5,040	43,632	8.7

ECONOMICS FOR THE TAYLOR SOUTH TIMBER SALE PROPOSAL

METHODS

The basic method for the economic analysis is a nondiscounted cash flow, which tries to estimate the flow of revenues and costs from the different treatments that are related only to this project. Due to the fact that projecting treatments into the future is uncertain due to changes in policies, markets, personnel, and natural events, no future activities are included. The analysis estimates the cash flow from timber harvesting and nonadministrative costs for the alternatives considered. DNRC does not have a formal accounting system to track costs for individual projects from start to finish. An annual cash-flow analysis is conducted on DNRC's forest-product sales program. The results from previous years can be found in the previous section, *PAST COSTS AND REVENUES FROM THE DNRC FOREST SALE PROGRAM.*

The results of the nondiscounted

TABLE G-4 - SALE-SPECIFIC FOREST-IMPROVEMENT COST BY ALTERNATIVE AND METHOD

	ACRES	COST $/ACRE	TOTAL COST ($)
Alternative A: N/A			
Alternative B:			
Planting	363	102	37,090
Excavator Piling	450	95	42,750
Slashing	382	60	22,920
Total			102,760
Alternative C:			
Planting	300	78	23,460
Excavator Piling	395	95	37,525
Slashing	395	40	15,800
Total			76,785

TABLE G-5 - COSTS AND BENEFITS ASSOCIATED WITH THIS PROJECT BY ALTERNATIVE

	ALTERNATIVES		
	A	B	C
1. Estimated total harvest volume (MBF)	0	4,375	4,660
2. Development cost ($/MBF)		64	60
3. Estimated stumpage value ($/MBF)		165	168
4. FI ($/MBF)		52	52
5. Estimated stumpage value, FI, and development cost ($/MBF) (Line 2 + line 3 + line 4)		281	280
6. Total timber-dollar value based on estimated stumpage value, FI cost, and development cost multiplied by the estimated harvest volume (line 5 * line 1)		1,229,375	1,304,800
7. Estimated stumpage value and FI ($/MBF) (line 3 + line 4)		217	220
8. Total timber-dollar revenue to the State (estimated stumpage value + FI cost multiplied by estimated harvest volume) (line 7 * line 1)	0	949,375	1,025,200
9. Total timber-dollar return to the trust (line 1 * line 3, does not include administration costs)		721,875	782,880
10. Other revenue related to the project area	6,090	6,090	6,090
11. Total dollar SSFI Costs *(TABLE G-4 -total of costs)*		102,760	76,785
12. SSFI costs ($/MBF) (line 11/line 1)		23	16

cash flow analysis appear in *TABLE G-4—SALE-SPECIFIC FOREST-IMPROVEMENT COST BY ALTERNATIVE AND METHOD* and *TABLE G-5—COSTS AND BENEFITS ASSOCIATED WITH THIS PROJECT BY ALTERNATIVE.*

ASSUMPTIONS

Assumptions Common to All Alternatives

The following assumptions were used to estimate the revenue and nonadministrative costs for each alternative:

- Costs, revenues, and estimate of return are estimates intended for relative comparison of alternatives. These estimates are not intended to be used as absolute return values.

- The harvested volumes for the alternatives were based on estimates made by Stillwater Unit personnel.

- The stumpage price was estimated using the current Transaction Evidence equation.

- Most of this proposed sale would be harvested by conventional tractor (90 percent) and the remaining 10 percent would be done with soft-tracked skidders.

- The development cost for the action alternatives is estimated to be $280,000, which includes $180,000 for replacement of the East Fork of Swift Creek bridge and $100,000 for roadwork. Development costs for this proposal are the estimated costs of road reconstruction, new road construction, road obliteration, and watershed improvements that would provide access to the State trust lands involved and improve water quality on State land. The purchaser is required to do the work as part of the contract. Development costs are a factor used in the current Transaction Evidence equation.

- The FI is based on programwide costs and the cost to maintain the ongoing staffing, treat stands, maintain roads for the current year, and acquisition rights-of-way. Money collected under FI from a purchaser provides the funding for the State to accomplish projects such as tree planting, site preparation, slash treatment, thinning, road maintenance, rights-of-away acquisitions, and some timber-sale-related activities. Thus, DNRC is able to improve the long-term productivity of timber stands on State trust lands and maintain or acquire access for future revenue-producing projects. The current FI fee for NWLO is approximately $52 per MBF.

- The sale-specific forest-improvement (SSFI) costs are the current cost estimates for the amount and types of treatments (site preparation, hazard reduction, planting, etc.) planned for each alternative being considered. Funding to complete these projects would be collected from current or future timber sales, depending on the timing of the treatments. These projects are funded with the FI fee ($52 per MBF). The FI fee is collected from timber-harvesting projects.

- The estimated total timber-dollar return to the trust is the estimated stumpage price (winning bid price $/MBF) multiplied by the estimated harvest volume.

- The estimated total timber-dollar amount collected by the State (total revenue) is: FI costs *plus* the estimated stumpage price *multiplied by* the estimated harvest volume.

SSFI costs and treatment acres can be found in *TABLE G-4 SALE-SPECIFIC*

FOREST-IMPROVEMENT COST BY ALTERANTIVE AND METHOD. Some of these projects may be delayed due to weather or future budget constraints.

The costs related to the administration of the timber sale program are only tracked at land office and Statewide levels. A formal accounting system is not in place to track costs for individual timber sales.

DNRC has a Statewide sustained-yield volume level of 42.164 MMBF per year. If DNRC does not select the highest volume alternative in this project, a relative amount of timber would be sold and harvested on State land elsewhere.

Limitations of the economic analysis:

- Only known costs and benefits that are associated with the activities listed in *TABLE G-5 -COSTS AND BENEFITS ASSOCIATED WITH THIS PROJECT BY ALTERNATIVES* are considered.
- None of the potential benefits associated with leaving trees are considered (i.e. snag recruitment, structural diversity, aesthetics, wildlife habitat, nutrient recycling).

ADDITIONAL COSTS ASSOCIATED WITH THE TAYLOR SOUTH TIMBER SALE PROPOSAL

The following assessment accounts for logging costs associated with the design and mitigation measures proposed for Action Alternatives B and C. These costs are accounted for in DNRC's calculation of an acceptable minimum bid when the timber is offered for sale. Some of the factors considered in this assessment of both alternatives are:

- ***Contract Length***

  The length of the contract would be approximately 3 years, which is typical for a project requiring this amount of roadwork and volume of timber to be harvested.

- ***Time Restrictions***

  The proposed contract would have several restriction on the timing of the harvest operations. Operations can be restricted any time of the year when soil moisture levels are too high to meet BMPs. Circumstances related to this type of restriction are uncertain and are a risk to efficient operations. Other time restrictions proposed in the design of this project are the restrictions for harvesting operations behind gates; hauling logs from behind gates may not occur between March 15 and June 30.

- ***Volume Per Acre to be Harvested and Skidding Distance***

  The volume per acre to be harvested is approximately 6 to 12 MBF per acre. The average skidding distance is estimated to be 750 feet, although some skids would be considerably longer. The volume per acre and average skid distance for harvesting are slightly greater than State and forest average.

- ***Use of Specialized Equipment***

  In order to meet BMPs, soft-track yarders would be required on the portions of the project area where slopes exceed 40-percent. The availability of soft-track yarders is low, so, therefore, may add to the overall logging costs. Contract clauses that allow for the consideration of optional yarding system use would be a part of the contract.

➢ **Haul Routes**

Related to the haul routes and their associated costs are 3 concerns:

- The cost of requiring logs from this sale to be hauled north to Olney with no option to use the paved county road around Whitefish Lake.

- One concern is related to the potential pavement damage from the estimated 15 loads of logs that would be hauled on East Lakeshore Road.

- The haul route around Whitefish Lake is narrow and curvy; while the route north to Olney is also narrow and curvy, there is less traffic.

Mitigations for any log hauling on East Lakeshore Road that may be applied to reduce road damage and increase safety include:

- checking road surfaces for damage caused by State operations and contacting the County Road Department for needed repairs;
- restricting times of log hauling, i.e. midday hauling only; and
- placing log truck hauling signs along East Lakeshore Road.

DIRECT EFFECTS

- ***Direct Effects Common to All Alternatives***

Revenue from General Recreational Use Licenses is difficult to estimate. Stillwater State Forest has other recreational areas where people may recreate. These areas also require a General Recreational Use License. Given the low compliance of recreationists on Stillwater State Forest buying the permit (based on surveys of Upper Whitefish Lake campers) and the low amount of revenue generated from this source, the potential impacts to revenue gain are very low.

TABLE G-6—ECONOMIC RETURN TO SPECIFIC TRUST BY ALTERNATIVE displays the estimated economic benefit of the No-Action and Action alternatives by specific beneficiaries.

TABLE G-6 – ECONOMIC RETURN TO SPECIFIC TRUST BY ALTERNATIVE

TRUST FUND	ALTERNATIVE A		ALTERNATIVE B		ALTERNATIVE C	
	MBF	$*	MBF	$*	MBF	$*
S.M.	0	0	670	111,675	705	118,400
S.N.S.	0	0	2,300	380,675	2,740	460,200
A.C.B.	0	0	670	111,675	710	19,550
A.C.B. & A.C.I.	0	0	600	100,075	435	73,000
D.& D.A.	0	0	100	17,675	70	11,730

**$ equals estimated MBF per trust times row 3 of TABLE G-5*

- ***Direct Effects of No-Action Alternative A***

Project area revenue would not change from the existing condition.

- ***Direct Effects Common to Action Alternatives B and C***

TABLE G-7—COMPARING HAUL COSTS FOR 2 SCENARIOS OF FINAL HAUL ROUTE DESTINATION summarizes 2 scenarios and their estimated costs for requiring the haul route to Olney. The 2 scenarios are displayed because the sale has not been sold and the final haul destination is not known. The first scenario assumes that the logs would be hauled to Columbia Falls and the second scenario assumes the logs would be hauled to Eureka.

TABLE G-7 - COMPARING HAUL COSTS FOR 2 SCENARIOS OF FINAL HAUL ROUTE DESTINATION

	ALTERNATIVE		
	A	B	C
Scenario 1 - Haul Destination Columbia Falls			
Project area to Columbia Falls via Olney	N/A	$20	$20
Project area to Columbia Falls via Whitefish Lake	N/A	$9	$9
Difference per MBF	N/A	$10	$11
Total Haul Difference (difference per MBF * sale volume)	N/A	$45,124	$48,063
Scenario 2 - Haul Route Destination Eureka			
Project area to Eureka via Olney	N/A	$22	$22
Project area to Eureka via Whitefish Lake	N/A	$24	$24
Difference per MBF	N/A	$2	$2
Total haul difference (difference per MBF * sale volume)	N/A	$9,025	$9,613

In short, the calculated stumpage value used in *TABLE G-5 - COSTS AND BENEFITS ASSOCIATED WITH THIS PROJECT BY ALTERNATIVE* uses the designated haul route via Olney. The "Difference per MBF" in this table displays the estimated amount per MBF that the State may have received if there was an option to haul along the East Lakeshore Road.

- ***Direct Effects of Action Alternative B***

The estimated project revenue to be deposited into trust accounts is $721,875; the estimated revenue to be deposited into the Forest Improvement (FI) account is $227,500. Nonadministrative costs for road work and the bridge replacement are estimated at $280,000. Hazard reduction and reforestation costs are estimated at $102,760, which is funded by the by FI account.

- ***Direct Effects of Action Alternatives C***

The estimated project revenue to be deposited into trust accounts is $782,880; the estimated revenue to be deposited into the FI account is $242,320. Nonadministrative costs for roadwork and the bridge replacement are estimated at $280,000. Hazard reduction and reforestation costs are estimated at $76,785, which is funded by the by FI account.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A***

No change would be expected to the annual cash flow for DNRC's statewide timber program provided another sale can be substituted to replace this project. No change to the area's economy would be expected provided a local mill purchases a substituted amount of timber. Lack of a viable substitution could result in a negative effect on either DNRC's annual cash flow or the area's economy. No change to existing nonadministrative costs would be expected.

- ***Indirect Effects Common to Action Alternatives B and C***

Additional cost considerations and risk assumptions that Purchasers may include in their bid are costs associated with snowplowing,

dust abatement, and road maintenance.

DNRC would also incur additional costs that are not reflected in *TABLE G-5 - COSTS AND BENEFITS ASSOCIATED WITH THIS PROJECT BY ALTERNATIVE*, such as:

- a reduction in income due to bid adjustments from dust-abatement requirements, snowplowing, and increased road maintenance;
- deferred maintenance, such as loss of existing gravel on the road surface;
- conflict with other licensed uses such as snowmobiling
- DNRC cooperating with the Flathead County Road Department with seasonal load limit restrictions and the general inspection of road surfaces, which would minimize conflicts regarding safe use of East Lakeshore Drive.

- ***Indirect Effects to Action Alternative B***

  No appreciable changes from the existing condition to the annual cash flow for DNRC's Statewide timber program or to the area's economy would be expected. Initial long-term road improvement and bridge replacement costs are estimated at $280,000, which also frees up the nonadministrative road-maintenance fund to be used elsewhere during the life of the project. The cost of reforestation is estimated at $102,760.

- ***Indirect Effects to Action Alternative C***

  No appreciable changes from the existing condition to the annual cash flow for DNRC's statewide timber program or to the area's economy would be expected. Initial long-term road improvement and bridge replacement costs are estimated at $280,000, which also frees up the nonadministrative road-maintenance fund to be used elsewhere during the life of the project. The cost of reforestation is estimated at $76,785.

CUMULATIVE EFFECTS

Cumulative Effects Common to All Alternatives

Conflicts with snowmobile use may occur regardless of this proposed sale; the Chicken/Werner Timber Sale Project or logging on private land could disrupt the snowmobile use of Lower Whitefish and Upper Whitefish roads. If portions of the Chicken/ Werner Timber Sale Project are logged during the winter, 10 miles of Lower Whitefish Road, to the junction of Upper Whitefish Road, may be plowed open; Upper Whitefish Road could be plowed open from Olney to, approximately, 9-mile. The Chicken/Werner Timber Sale Project could operate through 3 winter seasons (2001 through 2003).

If Upper Whitefish and Lower Whitefish roads were plowed, the remaining trail system would have limited access. Based on the current license values, the result could be a loss of approximately $2,500 a year if the snowmobile outfitters ask for a suspension of their license for those seasons.

Because of the methodologies used to analyze economics in regard to revenues and costs, the cumulative effects of other DNRC projects in the State and Northwest Land Office are included as part of the existing condition. Consequently, the direct and indirect effects analysis includes the cumulative economic effects.

APPENDIX H

AESTHETICS

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX H

AESTHETICS

INTRODUCTION

The aesthetics analysis concentrates on those areas where the timber harvest units and harvesting activities are proposed. The views of the harvest proposal will be provided in reference to foreground, middleground, and background viewpoints.

METHODS

Foreground views were analyzed from the open-road system within the project area. These views consider:

- disturbance to vegetation and soils from logging and site-preparation activities,
- effects of the silvicultural treatments on the stand structure, and
- the length of treatment along roadways (primarily where people drive, walk, or snowmobile).

Middleground views were analyzed based on examples of similar treatments and mitigations. Sight distances and their relationship to natural processes will be addressed in relation to middleground views.

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Background views were analyzed based on exposure of the proposed harvest areas and patterns of leave trees within the proposed harvest areas.

ANALYSIS AREA

The analysis area for the foreground and middleground viewpoints are along the DelRey and Lower Whitefish roads, and the 2 roads into Smith Lake Reservoir. The analysis area for background views includes portions of the Whitefish Divide as taken from the Whitefish Lake area and a point along the Upper Whitefish Lake Road (Milepost 5).

OVERVIEW OF THE PROJECT AREA

The Taylor South Timber Sale Project area is, predominately, covered with dense stands of mature, largely coniferous timber with the exception of those areas that were harvested in 1995 through 1996. These previously harvested areas were part of the Werner-Taylor Timber Sale and represent several silvicultural prescriptions, including "clearcuts with reserve trees", "seedtree with reserves", and "improvement harvests". The largest harvest unit size was 46 acres.

Features of interest within the Taylor South Timber Sale Project area that may be affected by harvesting activities include:

- the mature, dense stands of timber along miles of open road,

- Smith Lake, and
- legacy trees, relics, or "grandfather" trees, which are primarily western larch and ponderosa pine in the 30-inch-diameter class; these remain mostly in the southern portion of the project area. With the exception of several mistletoe-infected trees in Unit 13, most of these large trees would not be harvested under any alternative.

Swift Creek is not visible from the road systems within the project area; views of the numerous streams are minimal due to the heavy brush where the road crosses the streams.

Foreground views are areas where access by foot or vehicle are likely; middleground views are from a distance of 200 to 1,000 yards; background views are from a greater distance.

Foreground viewing of the area takes place most often by visitors driving and sightseeing on the DelRey and Lower Whitefish roads. Visitors also walk on the 2 roads into Smith Lake Reservoir; the road from the east is gated, the road from the west is not.

Presently, there is very little middleground viewing in the project area, except within the area harvested by the Werner/Taylor Timber Sale.

Background viewpoints were described in the 1993 Werner/Taylor Environmental analysis (EA), which concluded that the views into the Werner/Taylor Timber Sale Project area from established viewpoints were limited. Those viewpoint locations identified in the Werner/Taylor Timber Sale Project EA were:

- Whitefish Lake City Beach
- Whitefish Lake State Park
- Lion Mountain Estates
- Big Mountain
- Werner Peak Lookout

The Taylor South Timber Sale project area extends 1 mile south of the Werner/Taylor timber Sale Project area, but, partly due to the geographical location of State land in the project area, the conclusions are similar. The State ownership is mainly in the lower elevation portions of the Swift Creek drainage; therefore, ridges and trees break up much of the view into the proposed units.

One background viewpoint location not mentioned in the Werner/Taylor Timber Sale Project EA is approximately 5 miles from Olney on Upper Whitefish Road. This view is from within a 20-year-old sapling-sized stand.

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A***

  In the short term, shrubs and trees would continue to grow, limiting views from roadways.

- ***Direct Effects Common to Alternatives B and C***

  Both alternatives plan some harvesting within the roadside vegetation buffers, but some shrubs, saplings, and larger-diameter trees would be retained. As evidenced by buffers retained in 1995, the existing shrubs would likely grow in width and height and limit views into the harvest units on the uphillside of the roads. The vegetative buffers may not be as effective below roads due to the lack of past disturbance, which initiates shrub regeneration.

  Harvesting often causes damage to vegetation that is planned to be left. Timber Sale Contract specifications promote careful logging and felling operations, as

well as require damaged trees, especially the sapling-sized trees, to be felled.

Slash from limbs, tops, and rotten logs accumulate during harvesting operations of this scale; this debris appearance would last numerous years until grasses, shrubs, and small trees grow. This debris is usually left scattered over the ground for up to 1 year to return nutrients to the soils from the needles. To promote long-term soil productivity, the recommendation is for 10 to 15 tons (about one-half of a loaded log truck) of large debris per acre to be left on site. Under a separate FI contract, the amount of extra debris over 10 to 15 tons would be piled; site preparation for natural regeneration would also be accomplished under that contract.

To remove the logs on from large harvest areas, major skid trails and landings are required. The effect of such trails on the landscape, in part, depends on the season of operation; skidding over snow usually does not expose much soil. When that soil is disturbed or displaced, slash and debris are placed on the trails primarily to meet BMPs, but it also helps cover the trail. Landings are sites where logs are skidded from where the trees were cut. Generally, numerous of activities occur at landings: logs are readied for loading onto log trucks, slash is piled, and pickups and equipment are parked. Efficient design features help limit the size of these landings. Landings may be located along roadways, directly off roadways or away from the roadway and accessed by temporary "jump-up" roads. Landings are rehabilitated to meet hazard reduction standards and BMPs. Drainage is incorporated into the landing sites to keep them dry. The areas are grass seeded when all other reclamation work is done.

Vegetation damage and soil disturbance, visible as the foreground views, would have short-term effects with the following project-design elements and mitigation measures applied, which include, but are not limited to:

- felling extra trees damaged by logging,
- rebunching unburned slash piles in order to attain a complete burn,
- limiting the location, size, and number of landings,
- grass seeding disturbed sites, and
- placing slash on skid trails.

The last 3 mitigations are elements of BMPs that help to minimize erosion and speed the recovery and revegetation of disturbed soils. This contributes to some short-term visual effects.

Timber harvesting would occur along, approximately, 2.5 miles of open, maintained roadway. The segments of roadway with the most activities are between Milemarker 4 and 5.75 mile of Lower Whitefish Road and the first 1.25 miles of Taylor Creek Road (USFS Road 9790).

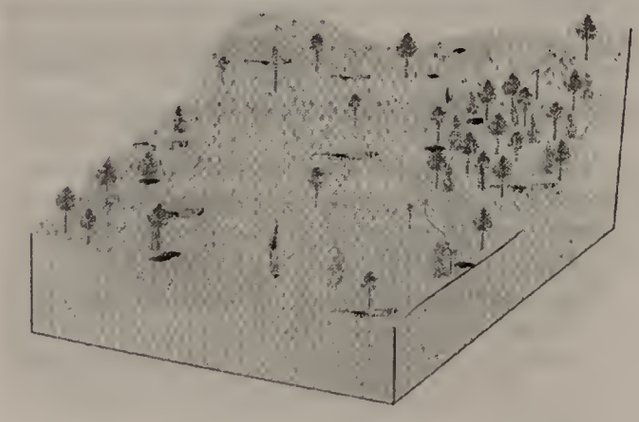
Activities around Smith Lake would be the same for Action Alternatives B and C. Along the west road into Smith Lake, side trails that are being used to access firewood or dispersed campsites would be closed with root wads, rocks, etc., in an effort to keep traffic on the main roadway. Along the east road into the dam, an improvement harvest is planned. Trees would be harvested, slash would be piled

and/or trampled to reduce fire hazards, and the existing vegetative buffer would be retained for, approximately, 165 feet along Smith Creek.

- ***Direct Effects of Action Alternative B***

FIGURE H-1 – GRAPHICAL REPRODUCTION OF A CLEARCUT WITH GROUP RETENTION provides visual representations of how this overall treatment may appear following harvesting. The visualizations are only a qualitative approximation of what would be expected to occur on the ground due to the variations and diversification of the stands treated in this project area. Each visualization portrays the geographical distributions of the treatment's effects across a harvest unit. Keep in mind that this is a representation of the remaining distribution of trees and that 1 tree from the visualization does not equate to 1 tree on the ground.
Harvesting would aesthetically affect the harvest area by removing mature trees and opening the view. Many current foreground views would become middleground views. Trees would be harvested to the road edge where topography would limit middleground views. Where topography would, potentially, allow long sight distances into harvest units, a vegetative screen would be retained. Some trees may be harvested with this screen area. Providing an adequate screen that would limit view distances into harvest units in areas below the road may be difficult to provide.

A-1 – GRAPHICAL REPORDUCTION OF A CLEARCUT WITH GROUP RETENTION



- ***Direct Effects of Action Alternative C***

Figure A-2 – Graphical Reproduction of a Modified Shelterwood provides a visual representations of how this overall treatment may appear following harvesting.
Harvesting would aesthetically affect the harvest area by removing some mature trees and opening the view from the roadside.

A-2 – GRAPHICAL REPRODUCTION OF A MODIFIED SHELTERWOOD

A vegetative screen would be retained along open roads. Some trees may be harvested within this

screen area. Providing an adequate screen that would limit view distances into harvest units in areas below the road may be difficult to provide.

Current foreground views would be altered and have fewer trees; however, in most circumstances, the views would not change to allow for middleground views.

The physical close-up view of slash, debris, skid trails, and landings would be lessened along the Lower Whitefish and Taylor Creek roads with the continuous vegetative screen left alongside the road.

INDIRECT EFFECTS

- ***Indirect Effects No-Action Alternative A***

  No indirect effects to aesthetics were determined.

- ***Indirect Effects of Action Alternative B***

  A treatment of clearcut/seedtree with groups of retention trees is the primary silvicultural prescription for Action Alternative B. The objective of this treatment visually is to pattern the harvest areas after a mixed-severity fire. This would:

  - leave jagged edges between cut and uncut areas; fires often create or burn "fingers" which is another way to describe this.
  - leave groups of trees as if the fire burned around areas or lightly burn through areas; areas with springs and/or quality wildlife trees and snags would be left to give this appearance.
  - leave scattered trees that would be, primarily, the thick-barked western larch, Douglas-fir, and ponderosa pine; these trees survive fires to varying levels.
  - cause large openings with very few live trees per acre.

  Patterning rough or fingered edges and feathering the area between cut and uncut can lessen visual impacts. The more natural the patterns, the less impact *(A. McQuillan, personal communication)*. Feathering means to leave more trees per acre as the unit approaches the edge, which would be done in areas of high visibility.

  FIGURE A-3 is an aerial photo that has been modified to simulate how the upper portions of the project area may look from an aerial view following harvest treatments. This figure displays an aerial view of the patterns that may be expected from the clearcut/ seedtree with group retention harvest treatment. Openings would be visible, though patterns would emulate potential natural events with feathered and jagged edges.

- ***Indirect Effects of Action Alternative C***

  Shelterwood with reserves is the primary silvicultural prescription for Action Alternative C. The visual objective of this treatment is to leave an even distribution of trees across the landscape. The tree species that would survive a fire may not be the same species that would be left following this prescription.

  Figure A-4 is an aerial photo that has been modified to simulate how the upper portions of the project area may look from an aerial view following harvest treatments.

  The exposure from harvesting would be minimal due to the view angles into the harvest units and the amount of canopy being retained.

CUMULATIVE EFFECTS

- ***Cumulative Effects Common to All Alternatives***

  Natural processes on the landscape, such as wildfires, blowdown events, insect infestations, or disease infections, would continue to alter the visual resource over time.

  In the short term, effects to the visual resource would be from present activities, such as firewood gathering and recreational use. Firewood harvesting causes varying amounts of damage to residual trees and shrubs along open roads. Also, varying levels of debris may be left on road surfaces and ditches due to firewood gathering.

  In the foreground, the right-of-way clearing along DelRey Road would remove all trees within its easement boundary, as proposed by the Flathead County Road Department; the slash produced would likely be chipped. Sight distances into adjacent timber stands and along the road would be increased, creating an "opened-up" appearance.

  Stillwater Unit may, potentially, enact its salvage harvest program in the area due to local infestations of the Douglas-fir bark beetle; this would add to the visible amount of logging debris. Department administration of the permits would enforce the cleanup of road surfaces, provide a clause to address slash disposal, and provide for the added protection of residual trees.

  The Chicken-Werner Timber Sale would likely open the view with the loss of mature trees. This would take place along approximately 5 additional total miles of both the Lower Whitefish and Werner Peak roads. What were, primarily, foreground views would now open up to middleground views. The pattern of trees remaining and size of the area being treated would appear similar to the results from a moderately severe fire. Roadside vegetation that is protected from harvesting activities would limit views into harvest units from roadways. Portions of harvest units would be visible from numerous vantage points.

FIGURE A-3—AERIAL PHOTO SIMULATION OF NORTHERN UNITS AS PROPOSED BY ALTERNATIVE B

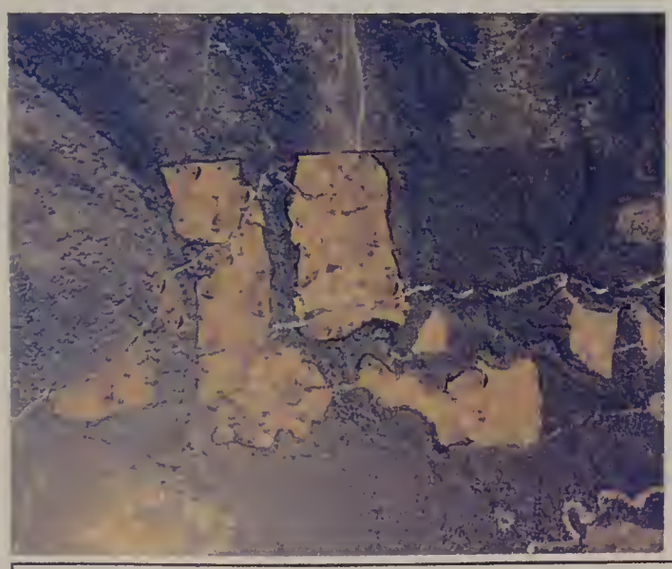
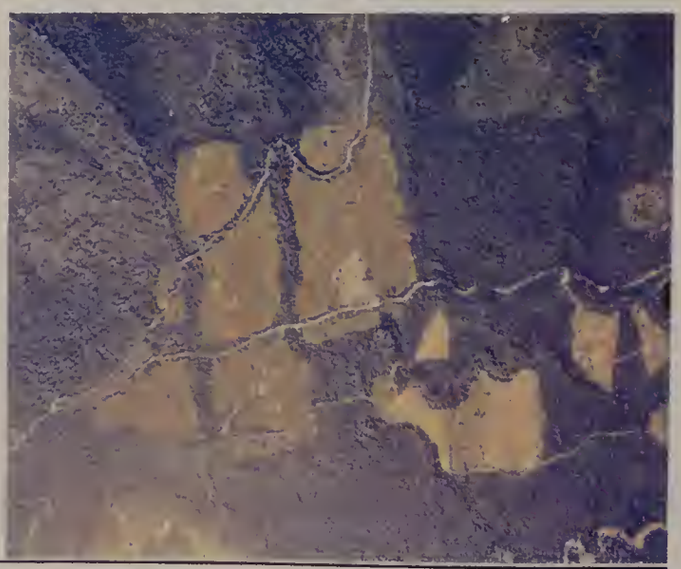


FIGURE A-4—AERIAL PHOTO SIMULATION OF NORTHERN UNITS AS PROPOSED BY ALTERNATIVE C



APPENDIX I

RECREATION

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX I

RECREATION

INTRODUCTION

The project area currently experiences various recreational uses by the general public.

METHODS

The methodologies used to portray the existing condition and determine recreational impacts of the project include determining the recreational uses, approximate revenues, and potential for conflict between project activities and recreational uses.

ANALYSIS AREA

The analysis area includes all legally accessible State land within the project area and the roads that would be used to haul equipment and logs.

EXISTING CONDITION

The Taylor South Timber Sale Project area receives recreational use throughout the year. Users range from berrypickers, snowmobilers, hikers, and hunters to vehicle drivers. Lower Whitefish Road is used to access other parts of Stillwater State Forest, including the Upper Whitefish Lake and adjacent USFS areas, such as Red Meadow Lake and the North Fork of Flathead River. The Smith Lake area is used for both day use and overnight camping.

There are 4 snowmobile outfitters that use the project area; the total annual rental fees are approximately $2,000. Lower and Upper Whitefish roads act as main access routes to State and Federal snowmobile trail systems. Also, the Flathead Snowmobile Association grooms trails and pays an annual license rental fee of $200.00. The project area has no special recreational licenses for outfitting other than the guided snowmobile tours.

State lands are available for nonmotorized recreational use to anyone purchasing a Recreational Use License for State lands. Licenses are not site specific and allow use of all legally accessible State lands; therefore, it is very difficult to determine the amount of recreational use and income resulting from license sales for a specific area. Statewide, from March 1, 1999 through February 28, 2000 (the recreational use licensing year), the total gross revenue to the Trust was $290,447. There are approximately 5,157,380 acres of Trust land Statewide *(Annual Report for FY 1998, surface acreage)*.

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Therefore, the average gross revenue is approximately $.056/acre ($290,447 divided by 5,157,380) for the license year 2000. Applying the Statewide average revenue per acre to the State land in the project area of approximately 5,000 acres produces an estimated revenue of $280 (.056 X 5,000 acres) per year from General Recreational Use Licenses, assuming this area receives an average amount of paid recreational use.

Conflicts have occurred between snowmobilers and loggers when roads have been plowed open during the winter. The Smith Lake area has experienced conflicts between local walk-ins and motorized day/overnight users, primarily dealing with the use of the area for parties and associated garbage.

DIRECT EFFECTS

- ***Direct Effects Common to All Alternatives***

  No change is expected to the status of roads in the Smith Lake Area; the road on the west side would remain open. For additional information refer to *CHAPTER II, ALTERNATIVES CONSIDERED BUT NOT GIVEN DETAILED STUDY*.

  The revenue from the General Recreational Use Licenses is difficult to estimate. Stillwater State Forest has other recreational areas where people may recreate. These areas also require a General Recreational Use License. Given the low compliance of recreationists on Stillwater State Forest buying the permit (based on surveys of Upper Whitefish Lake campers) and the low amount of revenue generated from this source, the potential impacts to revenue gain are very low.

- ***Direct Effects Common to Alternative B and C***

  Recreational uses and revenues are not anticipated to change from the existing condition. However, road improvements that encourage a broader range of vehicle types (sedans, pickups, all-terrain vehicles) may result in some increased use in the Smith Lake area.

  The overall complexity of removing and replacing culverts at Anchor, Hemlock, Taylor, and Vars creeks on the Lower Whitefish and Taylor Creek roads may require road closures for several days at each site.

  Delays up to several hours would be expected at the proposed bridge-replacement site near Upper Whitefish Lake. Reinforcing the existing bridge for use while preparing the new bridge site is planned.

INDIRECT EFFECTS

- ***Indirect Effects to No-Action Alternative A***

  Effects would not change from the existing condition.

- ***Indirect Effects to Action Alternatives B and C***

  The amount of recreation may change during the winter months. Revenues from the existing commercial licenses may decrease. Winter logging operations could increase the number of conflicts between snowmobilers and logging equipment. Conflicts at Smith Lake would not likely change from existing conditions.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A***

  Winter logging operations on the Chicken/Werner Timber Sale could increase the number of conflicts between snowmobilers and loggers.

- ***Cumulative Effects Common to All Alternatives***

  If Upper Whitefish and Lower Whitefish roads were plowed, the remaining trail system would have limited access and the amount of winter recreation could change. Based on the current license values, the result could be a loss of approximately $2,500 a year if the snowmobile outfitters ask for a suspension of their license for those seasons.

  Some delays may be expected along Lower and Upper Whitefish roads due to road maintenance and repair work.

  Conflicts with snowmobile users may occur regardless of this proposed sale; the Chicken/Werner Timber Sale Project or logging on private land could disrupt the snowmobile use of Lower Whitefish and Upper Whitefish roads. If portions of the Chicken/Werner Timber Sale Project are logged during the winter, 10 miles of Lower Whitefish Road to the junction of Upper Whitefish Road may be plowed; Upper Whitefish Road could be plowed from Olney to 9-mile. The Chicken/Werner Timber Sale Project could operate through 3 winter seasons (2001 through 2003).

  Mitigations have worked in the past for combining log-hauling operations and snowmobile recreation; specifically, agreements during the 1999/2000 season. Another mitigation option may be to develop alternative trail routes on the forest.

- ***Cumulative Effects Common to Action Alternatives B and C***

  In addition to the cumulative effects to all alternatives, several more miles of Lower Whitefish Road may be plowed during the winter. Due to the potential coordination between purchasers of the Chicken/Werner and Taylor South timber sales, there is an increased likelihood of the winter logging activity.

Air
Quality

APPENDIX J

AIR QUALITY

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX J

AIR QUALITY

INTRODUCTION

Air quality could be affected by prescribed burning and road dust created by project-related activities.

METHODS

The methodologies used to analyze effects to air quality include estimating the location, amount, and timing of smoke generated from prescribed burns, and road dust created by project-related activities.

ANALYSIS AREA

The analysis area for air quality includes all of Flathead County, which is a part of Montana Airshed 2 as defined by the Montana Airshed Group.

EXISTING CONDITION

Currently, the project area contributes very low levels of air pollution into the analysis area or local populations centers. Temporary reductions to air quality from the project area currently exist in the summer and fall due to smoke generated from prescribed burns and dust produced by vehicles driving on dirt and gravel roads. None of the air quality reductions currently affect local population centers beyond EPA standards. All burning activities currently comply with emission levels authorized by the Montana Airshed Group by all major burners in the analysis area. The project area is outside any of the local Impact Zones, where additional restrictions may be imposed to protect air quality.

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DIRECT EFFECTS

- ***No-Action Alternative A***

  The existing condition would not change.

- ***Action Alternative B and C***

  Postharvest burning would produce smoke emissions and log hauling and other project-related traffic on dirt roads would increase road dust during dry periods. None of these increases in emissions are expected to exceed standards or impact local population centers provided that the burning is completed within the requirements imposed by the Montana Airshed Group and dust-abatement material is applied to roads during dry periods.

INDIRECT EFFECTS

Common to All Alternatives

Since emissions are expected to remain within air quality standards, no indirect effects to human health at local population centers are anticipated.

CUMULATIVE EFFECTS

- ***No-Action Alternative A***

  The existing condition would not change.

- ***Action Alternatives B and C***

  Additional smoke produced from prescribed burning on adjacent USFS, private industrial forest lands, and State trust lands would remain within the standards for air quality, but the cumulative effect during peak burning periods could effect individuals at local population centers with respiratory illnesses for short durations. All known major burners operate under the requirements of the Montana Airshed Groups, which regulates the amount of emissions produced cumulatively by major burners.

Soils

APPENDIX K

SOILS

TAYLOR SOUTH TIMBER SALE PROJECT

APPENDIX K

SOILS

INTRODUCTION

Soil productivity plays an important role in forest ecosystems. Soil compaction may result in decreased percolation of runoff. Soil displacement can reduce productivity by eliminating potential seedbeds for forest regeneration, especially in locations with shallow surface soils. Soil nutrients are valuable for vegetative growth.

EFFECTS OF PAST ACTIVITIES TO SOIL PRODUCTIVITY

Cumulative effects to soil productivity are those impacts to soils that, individually, may not adversely affect the soil resource, but, when combined through repeated entries, may present impacts to productivity. Cumulative effects to soils are generally caused by repeated entries into the same stands.

METHODS

The cumulative effects of past activities to soil productivity were analyzed through a field inspection of the project area. Particular attention was given to old harvest units completed under past management. Maps of old sale areas and aerial photography were used to locate past harvest units, and the condition of the soil resource was determined through field visits. Skid-trail density was approximated to determine the percent of the area impacted.

The anticipated cumulative effects to soil productivity as a result of the proposed project were analyzed by estimating the acreage in the proposed harvest units trafficked by skid trails. The area of skid trails in an impacted condition (compaction and/or displacement sufficient to decrease productivity) is then estimated as a percentage of the total skid trail acreage. The monitoring done by DNRC and USFS showed that ground-based logging activity generates moderate to severe compaction and displacement on 7.5 to 10 percent of the ground trafficked, and that approximately 20 percentof the ground-based logging units are trafficked by skid trails (SFLMP Final EIS, 1996).

ANALYSIS AREA

The analysis area used to determine the cumulative effects of past management on soil productivity is the boundaries of the proposed project area. Impacts of past management located outside of the proposed project area would not be affected in any way by the current proposal.

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EXISTING CONDITION

Soil types in the proposed project area are composed mainly of deep glacial till in the lower portions of the Swift Creek valley and steep residual soils on mid and upper slopes of the Whitefish Range. Geology of the soils in the project area is residual soils weathered from bedrock and glacial till at the lower elevations. Parent material of the residual soil is argillite, siltite, and limestone from the Belt Supergroup. A brief description and management interpretations for the soil types found in the project area are listed in *TABLE K-2—SOIL DESCRIPTIONS*. These interpretations were taken from the FNF Land System Inventory.

Timber harvesting in the proposed project area began in the 1940s and 1950s. These entries consisted of overstory removals using ground-based machinery. Skid trails were spaced at approximately 200-foot intervals and, in some cases, were excavated into the hill. These trails are revegetating well and are not actively eroding. Most of the trails now have a fully mature forest canopy with trees growing in the trails. The Werner Taylor Timber Sale was completed in the mid- to late 1980s. In harvest units where ground-based machinery was used, not more than 15 percent of the harvest unit appears to be trafficked by skid trails. These levels of soil disturbance are within the accepted range where cumulative impacts to soil productivity are not a problem.

ENVIRONMENTAL EFFECTS

Timber harvesting and related activities have the potential to affect soil productivity. Skidding of downed trees and ground-based site preparation can displace fertile layers of topsoil, exposing less productive subsoil layers. Compaction of soils in skid trails also has the potential to decrease productivity of the soil. Road construction also creates compaction and displacement of soils, and this area is effectively removed from productivity.

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A***

  With the No-Action Alternative, there would be some continued effects to soil resources by erosion on open roads and skid trails with inadequate drainage.

- ***Direct Effects of Action Alternatives B and C***

  For all timber-harvesting alternatives, precautions would be taken to reduce soil impacts from the construction of temporary roads, skidding, and mechanical site preparation. The mitigation measures are listed below. The area of soil impacts would be limited to less than 15 percent of the harvest units to maintain long-term soil productivity.

  Ground-based skidding with rubber-tired skidders, tractors, or clippers are the most economical methods of timber harvesting on well-drained soils of moderate slope. Conventional skidders and tractors have a higher risk of affecting soils through displacement, compaction, and area of disturbance than soft-track skidders. Main skid trails can become compacted and reduce the long-term productivity of the site unless remediated. Soft-track skidders are specialized tractors that cause less displacement and compaction than conventional ground-based yarding equipment. These can be used on steeper slopes and more sensitive soils where rubber-tired skidders, tractors, or

clippers cannot operate.

Slash disposal and site preparation operations would incorporate a combination of broadcast burning and machine piling and scarification. Piling and scarification would be completed with a dozer where slopes are gentle enough to permit. Steeper slopes would have slash treatment and site preparation done with an excavator. Excavators have greater flexibility to ensure an even distribution of scalps for regeneration, can better distribute large woody debris, and cause less damage to soils than brush dozers. All piling and scarification would be limited to the area needed to accomplish silvicultural objectives.

Long-term soil productivity would be maintained by leaving 10 to 15 tons per acre of woody debris that is greater than 3 inches in diameter. As feasible, small debris and needles would be left on site. As this material decomposes, the nutrients would be incorporated into the soil.

TABLE K-1—SUMMARY OF DIRECT EFFECTS OF TIMBER HARVESTING ALTERNATIVES ON SOILS displays the anticipated impacts of Alternatives A, B and C of the proposed project.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A***

  In the long-term, soil compaction would decrease as the vegetation root mass helps to break up the soil.

- ***Indirect Effects Common to Alternatives B and C***

  Indirect effects of these alternatives would be a reduced growth rate for the replacement stand in the skid trails and reduced infiltration. Skid trails and landings would be limited to a maximum of 15 percent of the harvest area in order to minimize the effects. The season of use would be managed to operate in dry or frozen/snow-covered conditions to further reduce the potential impacts. Areas that may receive impacts would be restored to preharvest soil conditions as the freeze-thaw cycle continues.

TABLE K-1 - SUMMARY OF DIRECT EFFECTS OF TIMBER HARVESTING ALTERNATIVES ON SOILS

	ALTERNATIVE		
	A	B	C
Acres of harvesting	0	638	632
Acres of tractor yarding	0	638	632
Acres trafficked by skid trails[1]	0	128	126
Acres of ground-based site preparation	0	450	395
Maximum acres of soil impacted[2]	0	80	72
Percent of harvest unit surface impacted	0	12.5	11.4

[1]15-20 percent of ground-based harvest units.
[2]7.5-10 percent of skid trails and less than 15 percent of machine-piled area.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A***

  With the No-Action Alternative, there would be some continued effects to soil resources by erosion on open roads and skid trails with inadequate drainage. In the long-term, soil compaction would decrease as the vegetation root mass helps to break up the soil.

- ***Cumulative Effects Common to Alternatives B and C***

  Most of the acres proposed for ground-based harvesting were entered in the 1940s and 1950s for overstory-removal harvesting. The timber in these units was skidded with tractors; existing skid trail spacing in these stands is approximately 200 feet. In order to limit cumulative impacts to soils, these existing trails would be used for this proposal where practical. New skid trails would be used only if the existing skid trail layout would not meet current BMP standards.

  For all timber-harvesting alternatives, precautions would be taken to reduce cumulative soil impacts from the construction of temporary roads, skidding, and mechanical site preparation. Mitigation measures are listed below. The area of cumulative soil impacts would be limited to less than 15 percent of the harvest units to maintain long-term soil productivity.

  Long-term soil productivity would be maintained by leaving 10 to 15 tons per acre of woody debris greater than 3 inches in diameter. As feasible, small debris and needles would be left on site. As this material decomposes, the nutrients would be incorporated into the soil.

Mitigations Measures Common to Action Alternatives A and C

The following is a summary of mitigation measures that would be implemented to comply with BMPs and maintain long-term soil productivity. Cable yarding would be used on the steeper slopes and would have minimal impact to soils.

Mechanical harvesting operations would be conducted when soil is adequately dry, frozen, or snow-covered to minimize rutting and displacement.

Ground-based (tractor) harvesting would be limited to slopes less than 40 percent. Soft-track yarders are suitable on slopes up to 55 percent with less impact than conventional tractor skidding and would be used to reduce the degree of soil impact. Skid trails would not cover more than 20 percent of the surface in any cutting unit.

The contractor and sale administrator would agree to a general operation and skidding plan prior to equipment operations. Unless soft-track skidders are used, ground skidding would be limited to slopes less than 40 percent, unless soft-track yarders are used. Equipment used for skidding should be equipped with a winch system to cable skid on short slopes steeper than the recommended 40 percent.

During site-preparation activities, scarification would be limited to 30 percent of the area to avoid displacement. Ten to 15 tons of large woody debris and all needles would be retained and dispersed across the unit for nutrient cycling and maintaining long-term soil productivity.

TABLE K-2—SOIL DESCRIPTIONS

Soil Description					Management Implications			
Map Unit	Land Type	Geology	Subsoils	Surface Soils	Season of Use	Timber	Roads	Comments
10-2	Stream Bottoms Elev: 3000 to 5000 ft Slope: 0-5%	Stratified alluvial deposits of sand, silt, gravel	Rounded rock fragments	Grayish brown loam approx. 7 inches thick	Very Limited	Potential prod: Moderate Equip: Tractor operation Regen: limited by wet soils, frost pockets, competition	Low soil strength Wet soils limit road locations Flooding may damage culverts/bridges	Channel changes may produce large amounts of sediment. Practices which disturb soils on or adjacent to streambanks have a severe sediment hazard. Wet soils limit season of use.
12	Depressions, wet meadows Elev: 3000 to 5100 ft. Slope: 0-2%	Alluvial and lacustrine deposits or glacial drift	Organic layers	Organic deposits up to 60 inches thick	Very Limited	This unit only contains scattered trees and is poorly suited to timber productivity	Low soil strength Wet soils limit road locations	Water tables are at or near the surface for much of the year. Some shallow ponds found in this map unit. Riparian area—operation limited to frozen conditions.
14-2	Depressions/Stream bottoms Elev: 3000 to 5000 ft. Slope: 0-20%	Silty glacial lake sediments	Silty glacial lake sediments	Volcanic ash influenced loess 2-12 inches thick	Limited	Potential prod: high Equip: Tractor operation Regen: limited by frost pockets in low-lying areas	Cutbanks on terraces tend to slough Unsurfaced roads rut when wet	Ground based operations must be managed to limit impacts via compaction/displacement. Skid trails have moderate erosion hazards. Sediment from erosion is particularly damaging to fish spawning areas. Sediment delivery efficiency is low.
16	Alluvial Fans Elev: 3100 to 4800 ft. Slope: 5-25%	Stratified alluvial deposits of sand, silt gravel, cobble	Cobble and gravel	Medium textured, may be same as subsoil	Very Limited	Potential prod: high Equip: Tractor operation Regen: potential frost pocket limited; competition	Poorly suited to road building due to potential for ground water interception during excavation.	Tractor operation is limited by wet soils. Cable logging or logging on snow/frozen ground can overcome this limitation. Soils vary greatly within the map unit due to contributing soils higher on the slope.
23-9	Mountain slopes/ridges Elev: 3000 to 7000 ft Slope: 40-60%	Dense glacial till	Contain 35-80% rock fragments	Volcanic ash influenced loess 4-12 inches thick	Long Season	Potential prod: moderate/high Equip: cable operation on steeper slopes Regen: limited by competition	Roads perform well with standard location, construction and maintenance practices	Lower slopes are susceptible to soil compaction and displacement if not properly managed. Skid trails have moderate erosion hazard. Sediment delivery efficiency is moderate.
26C-7	Moraines Elev: 3000 to 5500 ft. Slope: 10-20%	Silty, dense glacial till	Contain 35-60% rounded rock fragments	Volcanic ash influenced loess 2-12 inches thick	Average	Potential prod: high Equip: Tractor operation Regen: limited by frost pockets in low-lying areas	Roads perform well with standard location, construction and maintenance practices	Soils are susceptible to soil compaction/displacement if not properly managed. Skid trails have moderate erosion hazard. Sediment delivery efficiency is high.
26C-9	This landtype is the same as 26C-7 except the slope is greater for this landtype.							
26C-8	Moraines Elev: 3000 to 5500 ft. Slope: 20-40%	Silty, dense glacial till	Contain 35-60% rounded rock fragments	Volcanic ash influenced loess 2-12 inches thick	Average	Potential prod: high Equip: Tractor operation Regen: good	Material exposed tends to slough on steep cutbanks	Soils are susceptible to soil compaction/displacement if not properly managed. Skid trails have moderate erosion hazard. Sediment delivery efficiency is moderate.
27-7	Kames/Kettles/Terraces Elev: 3000 to 5200 ft. Slope: 10-20%	Cobbly, sandy glacial till sorted by meltwater but not stratified	Contain 50-80% rounded rock fragments	Volcanic ash influenced loess 2-10 inches thick	Long	Potential prod: moderate Equip: Tractor operation Regen: may be limited by droughtiness	Roads perform well with standard location, construction and maintenance practices Moisture stress makes revegetation difficult	Soils are susceptible to soil compaction/displacement if not properly managed. Skid trails have moderate erosion hazard. Low lying areas which hold water for varying lengths of time may have a shorter season of use than portions of this landtype located on slopes. Sediment delivery efficiency is low.
27-8	Kames/Kettles/Terraces Elev: 3000 to 5200 ft. Slope: 10-20%	Cobbly, sandy glacial till sorted by meltwater but not stratified	Contain 50-80% rounded rock fragments	Volcanic ash influenced loess 2-10 inches thick	Long	Potential prod: moderate Equip: Tractor operation Regen: limited by droughtiness and frost pockets in low-lying areas	Material exposed tends to ravel on steep cutbanks Moisture stress makes revegetation difficult	Soils are susceptible to soil compaction/displacement when wet. Skid trails have moderate erosion hazard. Sediment delivery efficiency is low.
28-7	Terraces Elev: 3000 to 4600 ft. Slope: 0-20%	Stratified glacial outwash	Contain 35-80% rounded rock fragments	Volcanic ash influenced loess 2-7 inches thick	Long	Potential prod: moderate Equip: Tractor operation Regen: may be limited by droughtiness	Moisture stress makes revegetation difficult	Soils are susceptible to soil compaction/displacement if not properly managed. Skid trails have moderate erosion hazard. Sediment delivery efficiency is low.
55	This landtype is located on glaciated mountain slopes ranging from 3300 to 5500 feet in elevation with slopes of 40-60%. This map unit is mostly barren due to the soils being found in limited areas in bedrock fractures This map unit is not suited for timber management.							
73	Glacial trough walls Elev: 3500 to 6000 ft. Slope: 60-90%	Residual soils on higher elevations; glacial till on lower	Up to 80% rock angular rock fragments	Volcanic ash influenced loess 7-14 inches thick	Average	Potential prod: moderate/high Equip: Cable Regen: limited by competition, moisture stress	Due to rockiness , roads are rough when finished . Revegetation is difficult due to moisture stress.	This landtype has many avalanche chutes. Sediment delivery efficiency is low on upper slopes and high on lower slopes.
75	This landtype is located on breaklands. Elevation ranges from 3200 to 9500 feet. Limestone cliffs with talus at the base are indicative of this map unit. Small areas of shallow soils support grasses, shrubs and scattered Douglas fir and subalpine fir. This landtype is poorly suited for timber management.							

GLOSSARY

TAYLOR SOUTH TIMBER SALE PROJECT

GLOSSARY

Administrative road use
Road use that is restricted to DNRC personnel and contractors or for purposes such as monitoring, forest improvement, fire control, hazard reduction, etc.

Airshed
An area defined by a certain set of air conditions; typically a mountain valley in which air movement is constrained by natural conditions such as topography.

Appropriate conditions
Describes the set of forest conditions determined by DNRC to best meet the State Forest Land Management Plan (SFLMP) objectives. The four main components useful for describing an appropriate mix of conditions are cover type proportions, age class distributions, stand structural characteristics, and the spatial relationships of stands (size, shape, location, etc.), all assessed across the landscape.

Basal area
A measure of the number of square feet of space occupied by the stem of a tree.

Best Management Practices (BMPs)
Guidelines to direct forest activities, such as logging and road construction, for the protection of soils and water quality.

Biodiversity
The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Board foot
144 cubic inches of wood that is equivalent to a piece of lumber 1-inch thick by 1-foot wide by 1-foot long.

Canopy
The upper level of a forest, consisting of branches and leaves of taller trees.

Canopy closure
The percentage of a given area covered by the crowns, or canopies, of trees.

Cavity
A hollow excavated in trees by birds or other animals. Cavities are used for roosting and reproduction by many birds and mammals.

Compaction
Increase in soil density caused by force exerted at the soil surface, modifying aeration and nutrient availability.

Connectivity
The quality, extent, or state of being joined; unity; the opposite of fragmentation.

Core area
See Security Habitat (grizzly bears).

Cover
See HIDING COVER and/or THERMAL COVER.

Co-dominant tree
A tree which extends its crown into the canopy, receiving direct sunlight from above and limited sunlight on its sides. One or more sides are crowded by the crowns of other trees.

Coarse down woody material
Dead trees within a forest stand that have fallen and begun decomposing on the forest floor.

Crown cover or crown closure
The percentage of a given area covered by the crowns of trees.

Cull
A tree of such poor quality that it has no merchantable value in terms of the product being cut.

Cutting units
Areas of timber proposed for harvest.

Cumulative effect
The impact on the environment that results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor actions, but collectively they may compound the effect of the actions.

Direct effect
Effects on the environment that occur at the same time and place as the initial cause or action.

Discounting
In economics, a method of accounting for the value of money over time, its ability to earn interest, so that costs and benefits occurring at different points in time are brought to a common date for comparison.

Ditch relief
A method of draining water from roads using ditches and a corrugated metal pipe. The pipe is placed just under the road surface.

Dominant tree
Those trees within a forest stand that extend their crowns above surrounding trees and capture sunlight from above and around the crown.

Drain dip
A graded depression built into a road to divert water and prevent soil erosion.

Ecosystem
An interacting system of living organisms and the land and water that make up their environment; the home place of all living things, including humans.

Environmental effects
The impacts or effects of a project on the natural and human environment.

Equivalent clearcut area (ECA)
The total area within a watershed where timber has been harvested, including clearcuts, partial cuts, roads, and burns.

Allowable ECA - The estimated number of acres that can be clearcut before stream channel stability is affected.

Existing ECA - The number of acres that have been previously harvested taking into account the degree of hydrologic recovery that has occurred due to revegetation.

Remaining ECA -The calculated amount of harvest that may occur without substantially increasing the risk of causing detrimental effects to stream-channel stability.

Excavator piling
The piling of logging residue using an excavator.

Fire regimes
Describes the frequency, type, and severity of wildfires. Examples include: frequent, nonlethal underburns; mixed-severity fires; and stand-replacement or lethal burns.

Forage
All browse and nonwoody plants available to wildlife for grazing.

Forest improvement
The establishment and growing of trees after a site has been harvested. Associated activities include site preparation, planting, survival checks, regeneration surveys, and stand thinnings; road maintenance; resource monitoring; noxious weed management; and right of way acquisition on a State Forest.

Fragmentation (forest)
A reduction of connectivity and increase in sharp stand edges resulting when large contiguous areas of forest with similar age and structural character are interrupted through disturbance (e.g., stand-replacement fire, timber harvesting).

Habitat
The place where a plant or animal naturally or normally lives and grows.

Habitat type
The place or type of site where a plant or animal naturally or normally lives and grows.

Hazard reduction
The abatement of a fire hazard by processing logging residue with methods such as separation, removal, scattering, lopping, crushing, piling and burning, broadcast burning, burying, and chipping.

Hiding cover
Vegetation capable of hiding some specified portion of a standing adult mammal from human view at a distance of 200 feet.

Historical forest condition
The condition of the forest prior to settlement by Europeans.

Indirect effects
Secondary effects that occur in locations other than the initial action or significantly later in time.

Intermediate trees
A characteristics of certain tree species which allows them to survive in relatively low light conditions, although they may not thrive.

Interdisciplinary team
A team of resource specialists brought together to analyze the effects of a project on the environment.

Landscape
An area of land with interacting ecosystems.

Mitigation measure
An action or policy designed to reduce or prevent detrimental effects.

Moving-window analysis
A computer-based method that, in this EIS, is used to quantify the area influenced by roads in a study area. Starting with the pixel in the upper left corner of the computerized subunit map, the computer calculates how many miles of road exist within a 1-square-mile "window" around that pixel. It moves to the next pixel and repeats the process until the road density is calculated in a 1-square-mile area around every pixel in the study area. The number and percentage of pixels in the study area that fall into different road density classes are then calculated by the computer.

Based on research studying the effects of roads on grizzly bears, the effects of open roads are measured by the percentage of the pixels in the study area that have at least 1.0 mile of open road in the surrounding 1-square-mile window. The effects of total roads (open, gated, barricaded, bermed, but not brushed, etc.) are measured by the percentage of pixels in the study area that have at least 2 miles of open or restricted roads in the surrounding 1-square-mile window.

Multistoried stands
Timber stands with two or more distinct stories.

Nest site area (bald eagle)
The area in which human activity or development may stimulate abandonment of the breeding area, affect successful completion of the nesting cycle, or reduce productivity. It is either mapped for a specific nest, based on field data, or, if that is impossible, is defined as the area within a ¼-mile radius of all nest sites in the breeding area that have been active within 5 years.

No-action alternative
The option of maintaining the status quo and continuing present management activities and/or not implementing the proposed project.

Nonforested area
A naturally occurring area where trees do not establish over the long term, such as a bog, natural meadow, avalanche chute, and alpine areas.

Old growth
Working definition - Old growth is defined by DNRC as stands that are 150 years and older (140 for lodgepole pine) and that exhibit a range of structural attributes associated with old age.

Conceptual definition - The term old growth is sometimes used to describe the later, or older, stages of natural development of forest stands. Characteristics associated with old-growth generally include relatively large old trees, containing a wide variation in tree sizes, exhibiting some degree of a multi-storied structure, having signs of decadence, such as rot and spike-topped structure, and containing standing large snags and large down logs.

Old-growth network
A collection of timber stands that are selected to meet a management strategy that would retain and recruit old growth over the long term. Elements that are considered in the selection of stands include biodiversity, wildlife, the spatial arrangement of stands and their relationship to landscape patterns and processes.

Overstory
The level of the forest canopy including the crowns of dominant, codominant and intermediate trees.

Patch
A discrete area of forest connected to other discrete forest areas by relatively narrow corridors; an ecosystem element (such as vegetation) that is relatively homogeneous internally, but differs from what surrounds it.

Potential nesting habitat (bald eagle)
Sometimes referred to as 'suitable nesting habitat', areas that have no history of occupancy by breeding bald eagles, but contain potential to do so.

Project file
A public record of the analysis process, including all documents that form the basis for the project analysis. The project file for the Beaver Lake Timber Sale Project EIS

is located at the Stillwater State Forest office near Olney, Montana.

Redds
The spawning ground or nest of various fish species.

Regeneration
The replacement of one forest stand by another as a result of natural seeding, sprouting, planting, or other methods.

Residual stand
Trees that remain standing following any cutting operation.

Road construction activities
In general, "road construction activities" refers to all the activities conducted while building new roads, reconstructing existing roads, and obliterating roads. These activities may include any or all of the following:

- road construction
- right-of-way clearing
- excavation of cut/fill material
- installation of road surface and ditch drainage features
- installation of culverts at stream crossings
- burning right-of-way slash
- hauling and installation of borrow material
- blading and shaping road surfaces

Road improvements
Construction projects on an existing road to improve ease of travel, safety, drainage, and water quality.

Saplings
Trees 1.0 inches to 4.0 inches in diameter at breast height.

Sawtimber trees
Trees with a minimum dbh of 9 inches.

Scarification
The mechanized gouging and ripping of surface vegetation and litter to expose mineral soil and enhance the establishment of natural regeneration.

Scoping
The process of determining the extent of the environmental assessment task. Scoping includes public involvement to learn which issues and concerns should be addressed, and the depth of assessment that will be required. It also includes a review of other factors such as laws, policies, actions by other landowners, and jurisdictions of other agencies that may affect the extent of assessment needed.

Security
For wild animals, the freedom from the likelihood of displacement or mortality due to human disturbance or confrontation.

Security habitat (grizzly bears)
An area of a minimum of 2,500 acres that is at least 0.3 miles from trails or roads with motorized travel and high-intensity, nonmotorized use during the nondenning period.

Seedlings
Live trees less than 1.0 inch dbh.

Sediment
In bodies of water, solid material, mineral or organic, that is suspended and transported or deposited.

Sediment yield
The amount of sediment that is carried to streams.

Seral
Refers to a biotic community that is in a developmental, transitional stage in ecological succession.

Shade intolerant
Describes tree species that generally can only reproduce and grow in the open or where the overstory is broken and allows

sufficient sunlight to penetrate. Often these are seral species that get replaced by more shade-tolerant species during succession. In Stillwater State State Forest, shade-intolerant species generally include ponderosa pine, western larch, Douglas-fir, western white pine, and lodgepole pine.

Shade tolerant
Describes tree species that can reproduce and grow under the canopy in poor sunlight conditions. These species replace less shade-tolerant species during succession. In Stillwater State Forest, shade-tolerant species generally include subalpine fir, grand fir, Douglas-fir, Engelmann spruce, and western red cedar.

Silviculture
The art and science of managing the establishment, composition, and growth of forests to accomplish specific objectives.

Site Preparation
A hand or mechanized manipulation of a harvested site to enhance the success of regeneration. Treatments are intended to modify the soil, litter, and vegetation to create microclimate conditions conducive to the establishment and growth of desired species.

Slash
Branches, tops, and cull trees left on the ground following a harvest.

Snag
A standing dead tree or the portion of a broken off tree. Snags may provide feeding and/or nesting sites for wildlife.

Snow intercept
The action of trees and other plants in catching falling snow and preventing it from reaching the ground.

Spur roads
Low standard roads, constructed to meet minimum requirements for harvest-related traffic.

Stand
An aggregation of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition so to be distinguishable from the adjoining forest.

Stand density
Number of trees per acre.

Stocking
The degree of occupancy of land by trees as measured by basal area or number of trees and as compared to a stocking standard, which is an estimate of either the basal area or number of trees per acre required to fully use the growth potential of the land.

Stream gradient
The slope of a stream along its course, usually expressed in percentage indicating the amount of drop per 100 feet.

Stumpage
The value of standing trees in the forest. Sometimes used to mean the commercial value of standing trees.

Substrate scoring
Rating of streambed particle sizes.

Succession
The natural series of replacement of one plant (and animal) community by another over time in the absence of disturbance.

Suppressed
The condition of a tree characterized by a low-growth rate and low vigor due to competition with overtopping trees.

Texture
A term used in visual assessments indicating distinctive or identifying features of the landscape depending on distance.

Thermal cover
For white-tailed deer, thermal cover has 70% or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller.

For elk and mule deer, thermal cover has 50% or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller.

Timber-harvesting activities
In general, timber-harvesting activities refers to all the activities conducted to facilitate timber removal before, during, and after the timber is removed. These activities may include any or all of the following:

- felling standing trees and bucking into logs
- skidding logs to a landing
- processing, sorting, and loading logs at the landing
- hauling logs to a mill
- slashing and sanitizing residual vegetation damaged during logging
- machine piling logging slash
- burning logging slash
- scarification, site preparation
- planting trees

Transaction Evidence Equation
Multivariant regression based on past sales and market variables.

Understory
The trees and other woody species growing under a, more-or-less, continuous cover of branches and foliage formed collectively by the overstory of adjacent trees and other woody growth.

Uneven-aged stand
Various ages and sizes of trees growing together on a uniform site.

Ungulates
Hoofed mammals, such as mule deer, white-tailed deer, elk, moose, which are mostly herbivorous and many are horned or antlered.

Vigor
The degree of health and growth of a tree or stand.

Watershed
The region or area drained by a river or other body of water.

Water yield
The average annual runoff for a particular watershed expressed in acre-feet.

Water yield increase
An increase in average annual runoff over natural conditions due to forest canopy removal.

Windthrow
A tree pushed over by wind. Windthrows (blowdowns) are common among shallow rooted species and in areas where cutting or natural disturbances have reduced the density of a stand so individual trees remain unprotected from the force of the wind.

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